SICOM6496

Industrial Ethernet Switch

Software Operation Manual

KYLAND Technology Co., Ltd.

Preface

SICOM6496 industrial Ethernet switches, a series of high performance routing switches developed by KYLAND, are used as core devices in campus network and enterprise network, or convergence layer devices in IP MAN (Metropolitan Area Network).

We compile this manual for your better understanding, use and routine maintenance of SICOM6496. Please read this manual carefully before using and configuring switches in order to avoid damages on switch or impact normal use. Thanks for choosing KYLAND. We believe that our products and services can make you satisfied.

This manual mainly includes the following contents:

Chapter 1 Setup configuration;

Chapter 2 Switch management

Chapter 3 Switch basic configuration

Chapter 4 Interface configuration

Chapter 5 MAC address table configuration

Chapter 6 VLAN configuration

Chapter 7 IGMP Snooping configuration

Chapter 8 ACL configuration

Chapter 9 Port Channel configuration

Chapter 10 DHCP configuration

Chapter 11 QoS configuration

Chapter 12 L3 forwarding configuration

Chapter 13 Routing protocol configuration

Chapter 14 Multicast protocol configuration

Chapter 15 MSTP configuration

Chapter 16 VRRP configuration

Chapter 17 DT-Ring protocols

Contents

Preface 2
Chapter 1 Setup Configuration 10
1.1 Setup Configuration 10
1.2 Setup Main Menu 10
1.3 Setup Sub-menu 10
1.3.1 Host Name Configuration 10
1.3.2 Vlan 1 Interface Configuration 11
1.3.3 Telnet Server Configuration 11
1.3.4 SNMP Configuration 12
1.3.5 Exit from Setup Configuration Mode 13
Chapter 2 Switch Management 14
2.1 Management Methods 14
2.1.1 Out-of-band Management 14
2.1.2 In-band Management 18
2.2 Management Interface 20
2.2.1 CLI Interface 20
2.2.2 WEB Interface 25
Chapter 3 Switch Basic Configuration 28
3.1 Basic Configuration Commands 28
3.1.1 Clock set 28
3.1.2 config 28
3.1.3 enable 28
3.1.4 enable password 28
3.1.5 exec timeout 29
3.1.6 exit 29
3.1.7 help 30
3.1.8 ip host 30
3.1.9 hostname 30
3.1.10 reload 30
3.1.11 set default 31
3.1.12 setup 31
3.1.13 language 31
3.1.14 write 31
3.2 Maintenance and Debugging Commands 32
3.2.1 ping 32
3.2.2 Telnet 33
3.2.3 traceoute 36
3.2.4 show 36
3.2.5 Debug 41
3.3 Switch IP address Configuration 41
3.3.1 Task sequence of switch IP address configuration 41
3.3.2 Switch IP Address Configuration Commands 42

3.4 SNMP configuration 43
3.4.1 SNMP introduction 43
3.4.2 MIB introduction 43
3.4.3 RMON introduction 44
3.4.4 SNMP Configuration 44
3.4.5 SNMP Typical Configuration Example 47
3.4.6 SNMP Troubleshooting Help 48
3.5 Switch Update 50
3.5.1 BootROM Mode 50
3.5.2 FTP/TFTP update 53
3.6 LLDP configuration 63
3.6.1 LLDP protocol introduction 63
3.6.2 LLDP configuration 64
3.6.3 LLDP configuration example 65
3.6.4 LLDP troubleshooting help 66
3.7 WEB Management 67
3.7.1 Switch Basic Configuration 67
3.7.2 SNMP Configuration 68
3.7.3 Switch Update 71
3.7.4 Maintenance and Debugging Commands 73
3.7.5 WEB Server User Configuration 75
3.7.6 Telnet Server Configuration 76
3.7.7 Switch Maintenance 77
3.7.8 LLDP Configuration 77
Chapter 4 Interface Configuration 79
4.1 Interface Introduction 79
4.2 Interface Configuration 79
4.2.1 Ethernet Interface Configuration 79
4.2.2 VLAN interface configuration 84
4.2.3 Network management interface configuration 85
4.2.4 port mirroring configuration 88
4.3 port configuration example 89
4.4 port troubleshooting help 90
4.4.1 monitoring and debugging command 90
4.4.2 port troubleshooting help 91
4.5 WEB management 91
4.5.1 Ethernet interface configuration 91
4.5.2 Layer 3 interface configuration 93
4.5.3 port mirroring configuration 94
4.5.4 Port Debug and Maintenance 95
Chapter 5 MAC Address Table Configuration 97
5.1 MAC address table introduction 97
5.1.1 MAC address table obtaining 97
5.1.2 forwarding and filtering 98

5.2 MAC address table configuration....98
5.2.1 mac-address-table aging-time....98
5.2.2 mac-address-table....99
5.3 typical configuration example....99
5.4 troubleshooting help....100
5.4.1 monitoring and debugging commands....100
5.4.2 troubleshooting help....101
Chapter 6 VLAN Configuration....102
6.1 VLAN Introduction....102
6.2 VLAN configuration....102
6.2.1 task sequence of VLAN configuration....102
6.2.2 VLAN configuration mode....104
6.2.3 VLAN typical application....106
6.3 GVRP Configuration....108
6.3.1 task sequence of GVRP configuration....108
6.3.2 GVRP command introduction....109
6.3.3 GVRP typical application....110
6.4 VLAN troubleshooting help....112
6.4.1 monitoring and debugging information....112
6.4.2 VLAN troubleshooting help....114
6.5 WEB Management....114
6.5.1 VLAN configuration....114
6.5.2 GVRP Configuration....118
6.5.3 VLAN Debug and Maintenance....119
Chapter 7 IGMP Snooping Configuration....121
7.1 IGMP Snooping Introduction....121
7.2 IGMP Snooping Configuration....121
7.2.1 Task Sequence of IGMP Snooping Configuration....121
7.2.2 IGMP Snooping Configuration Command....122
7.3 IGMP Snooping Example....124
7.4 IGMP Snooping troubleshooting help....127
7.4.1monitoring and debugging commands....127
7.4.2 IGMP Snooping Troubleshooting help....129
7.5 WEB Management....129
7.5.1 Enab IGMP snooping function....130
7.5.2 IGMP Snooping Configuration....130
7.5.2 IGMP Snooping static multicast configuration....131
7.5.4 Show IGMP Snooping Information....131
Chapter 8 ACL Configuration....132
8.1 ACL introduction....132
8.1.1 Access-list....132
8.1.2 Access –group....132
8.1.3 Access-list action and global default action....132
8.2 ACL Configuration....132

8.2.1 Task sequence of ACL configuration 132
8.2.2 ACL Configuraiton Commands 136
8.3 ACL example 139
8.4 ACL troubleshooting help 140
8.4.1 ACLmonitoring and debugging commands 140
8.4.2 ACL troubleshooting help 141
8.5 WEB Management 141
8.5.1 Add Standard Numeric ACL 142
8.5.2 Delete Numeric ACL 142
8.5.3 Numeric Extended ACL Configuration 142
8.5.4 Standard ACL Name Configuration and Delete Name ACL 143
8.5.5 Extended ACL name Configuration 143
8.5.6 Fierwall Configuration 144
8.5.7 ACL Port Binding 144
Chapter 9 Port Channel Configuration 146
9.1 Port Channel introduction 146
9.2 Port Channel Configuration 147
9.2.1 Task sequence of port channel configuration 147
9.2.2 Port Channel configuration mode 147
9.3 Port Channel Example 148
9.4 Port Channel troubleshooting help 150
9.4.1 Monitoring and debugging command 151
9.4.2 Port Channel troubleshooting help 154
9.5 WEB Management 154
9.5.1 LACP port group configuration 154
9.5.2 LACP port configuration 155
Chapter 10 DHCP Configuration 157
10.1 DHCP Introduction 157
10.2 DHCP server configuration 158
10.2.1 Task sequence of DHCP server configuration 158
10.2.2 DHCP server configuration commands 159
10.3 DHCP relay configuration 165
10.3.1 Task sequence of DHCP relay configuration 166
10.3.2 DHCP relay configuration commands 166
10.4 DHCP configuration example 167
10.5 DHCP troubleshooting help 170
10.5.1 Monitoring and debugging commands 170
10.5.2 DHCP troubleshooting help 173
10.6 WEB Management 173
10.6.1 DHCP server configuration 173
10.6.2 DHCP relay configuration 179
10.6.3 DHCP debugging 180
Chapter 11 QoS Configuration 182
11.1 QoS Introduction 182

11.2 QoS configuration 182
11.2.1 Task sequence of QOS configuration 182
11.2.2 QoS configuration mode 184
11.3 QoS example 191
11.4 QoS troubleshooting help 193
11.4.1 QoS debugging and monitoring commands 193
11.4.2 QoS troubleshooting help 197
11.5 WEB Management 197
11.5.1 Enable QoS 197
11.5.2 Calss-map Cofiguration 197
11.5.3 Policy map configuration 199
11.5.4 Apply QoS to port 201
11.5.5. Egress-queue configuration 203
11.5.6 QoS mapping configuration 205
Chapter 12 L3 forwrding configuration 209
12.1 layer 3 interface 209
12.1.1 layer 3 interface introduction 209
12.1.2 Layer3 interface configuration 209
12.2 IP forwarding 209
12.2.1 IP forwarding introduction 209
12.2.2 IP routing aggregation configuration 209
12.2.3 IP forwarding troubleshooting help 210
12.3 ARP 211
12.3.1 ARP introduction 212
12.3.2 ARP configuration 212
12.3.3 ARP forwarding troubleshooting 213
12.4 WEB management 214
12.4.1 Layer 3 interface configuration 214
12.4.2 IP route aggregation configuration 214
12.4.3 ARP configuration 215
Chapter 13 routing protocol configuration 217
13.1 routing table 217
13.2 static routing 217
13.2.1 static routing configuration 217
13.2.2 configuration example 219
13.2.3 troubleshooting help 220
13.3 RIP 220
13.3.1 RIP introduction 220
13.3.2 RIP Configuration 220
13.3.3 RIP typical example 233
13.3.4 RIP troubleshooting help 234
13.4 OSPF 236
13.4.1 OSPF configuration 236
13.4.2 OSPF Typical example 247

13.4.3 OSPF troubleshooting help 250
13.5 WEB management 257
13.5.1 Static Route Configuration 258
13.5.2 RIP 258
13.5.3 OSPF 262
13.5.4 show IP route 268
Chapter 14 Multicast protocol configuration 269
14.1 Multicast protocol 269
14.2 common mulitcast configuration 269
14.2.1 multicast configuration command 269
14.3 PIM-DM 269
14.3.1 PIM-DM configuration 269
14.3.2 PIM-DM typical example 271
14.3.3 PIM-DM troubleshooting help 271
14.4 PIM-SM 274
14.4.1 PIM-SM configuration 274
14.4.2 PIM-SM typical example 278
14.4.3 PIM-SM troubleshooting help 280
14.5 DVMRP 284
14.5.1 DVMRP configuraiton 284
14.6 IGMP 286
14.6.1 IGMP configuration 286
14.6.2 IGMP typical example 290
14.6.3 IGMP troubleshooting help 290
14.7 WEB management 292
14.7.1 Multicast Common Configuration 292
14.7.2 PIM-DM Configuration 293
14.7.3 PIM-SM configuration 293
14.7.4 DVMRP configuration 295
14.7.5 IGMP Configuration 297
14.7.6 Inspect and Debug multicast 298
Chapter 15 MSTP Configuration 300
15.1 MSTP 300
15.2 MSTP configuration 300
15.2.1 task sequence of MSTP configuration 300
15.2.2 MSTP configuration command introduction 301
15.3 MSTP Example 308
15.4 MSTP troubleshooting help 312
15.4.1 monitoring and debugging commands 312
15.4.2 MSTP troubleshooting help 315
15.5 WEB management 315
15.5.1 Enable MSTP 315
15.5.2 Enable port MSTP 316
15.5.3Set MSTP Region 316

15.5.4 Set instance 316
15.5.5 Set MSTP Time 317
15.5.6 Set MSTP Fast Transfer 317
15.5.7 MSTP information 317
Chapter 16 VRRP Configuration 319
16.1 VRRP 319
16.2 VRRP configuration 319
16.2.1 VRRP configuration tasks 319
16.2.2 VRRP configuration commands 319
16.3 VRRP example 322
16.4 VRRP troubleshooting help 323
16.4.1 monitoring and debugging commands 323
16.4.2 VRRP troubleshooting help 324
16.5 WEB Management 324
16.5.1 create/delete VRRP instance 324
16.5.2 VRRP Initialization 324
16.5.3 Set Preempt Mode 325
16.5.4 Set advertisement interval and Circuit Failover 325
16.5.5 VRRP Authentication 326
16.5.6 VRRP Information 326
Chapter 17 Configure DT-Ring Protocols 327
17.1 DT-Ring protocols introduction 327
17.2 DT-Ring introduction 327
17.3 Configure DT-Ring 327
17.3.1 DT-Ring configuration tasks 327
17.3.2 DT-Ring Configuration Commands 328
17.4 DT-Ring+ introduction 329
17.5 DT-Ring+ configuration 330
17.5.1 DT-Ring configuration tasks 330
17.5.2 DT-Ring configuration commands 330
17.6 DT-VLAN protocol introduction 331
17.7 DT-VLAN Configuration 331
17.7.1 DT-VLAN configuration tasks 331
17.7.2 DT-VLAN configuration commands 332
17.8 WEB Management 333
17.8.1 DT-Ring Mode 333
17.8.2 DT-Ring configuration 333
17.8.3 View and modify DT-Ring configuration 334

Chapter 1 Setup Configuration

Setup configuration means user's first configuration to the switch after purchase. For users who use SICOM6496 for the first time, Setup configuration is a good instruction. When user use CLI configuration interface, they can enter Setup configuration interface by typing the command "setup" in privilege user mode.

1.1 Setup Configuration

Setup is configured in menu form. In Setup configuration mode, it is able to configure switch host name, Vlan1 interface, Telnet service, SNMP, etc.

1.2 Setup Main Menu

Before entering main menu, you will be prompted to select language. "1" for Chinese and "0" for English.

Please select language:

[0]:English

[1]:中文

Selection(0|1)[0]:

Prompts in Setup English main menu:

Configure menu

[0]:Config hostname

[1]:Config interface-Vlan1

[2]:Config telnet-server

[3]:Config SNMP

[4]:Exit setup configuration without saving

[5]:Exit setup configuration after saving

Selection number:

1.3 Setup Sub-menu

1.3.1 Host Name Configuration

Select "0" in the Setup main menu, press "Enter", followed by below prompt:

Please input the host name[KYLAND]:

Note: The length of host name should be less than 30 characters. If user directly hit the Enter key and no name is given, the host name will be set to default “KYLAND”.

1.3.2 Vlan 1 Interface Configuration

Select “1” in Setup main menu, hit the Enter key, followed by below prompt, then start to configure interface of Vlan1

Config Interface-Vlan1

[0]: Config interface-Vlan1 IP address

[1]: Config interface-Vlan1 status

[2]: Exit

Selection number:

1. If select “0” in Vlan1 interface configuration menu and press the Enter key, the prompt is as follows:

   Please input interface-Vlan1 IP address (A.B.C.D):

   Enter a valid IP address of Vlan1 interface, press the Enter key, the prompt is as follows:

   Please input interface-Vlan1 mask [255.255.255.0]:

   The default mask of Vlan1 interface is 255.255.255.0. User can configure IP address and mask according to the actual network environment. After configuration, return to Vlan1 interface configuration menu.

2 If select “1” in Vlan1 interface configuration menu, press the Enter key, followed by below prompt:

   Open interface-Vlan1 for remote configuration ? (y/n) [y]:

   In first boot, system Vlan1 interface (CPU port) is closed; use this command to open switch Vlan1 interface. Hit the Enter key to open Vlan1 interface

3 If select “2” in Vlan1 interface configuration menu, return to the Setup main menu

1.3.3 Telnet Server Configuration

Select “2” in the Setup main menu, press Enter, followed by below prompt, then start to configure Telnet server.

Configure Telnet server

[0]: Add Telnet user

[1]: Config Telnet server status

[2]: Exit

Selection number:

1. If select “0” in Telnet sever configuration menu, press the Enter key, followed by below prompt:

   Please input the new telnet user name :

Note: The length of user name must be in the range of 1~16 characters. Input valid username, hit the Enter key. The prompt is as follows:

Please input the new telnet user password :

Note: The length of password must be in the range of 1~8 characters. After configuration of user

name and password, return to Telnet configuration menu.

2. If select “1” in Telnet server configuration menu, press Enter, followed by below prompt:

   Enable switch telnet-server or no?(y/n) [y]:

   If startup Telnet service is required, please type “y” or press Enter directly. If startupTelnet service is not needed, please type “n”, press Enter and return to Telnet server configuration menu.

3. If select “2” in Telnet server configuration menu, return to the Setup main menu.

1.3.4 SNMP Configuration

Select “3” in the Setup main menu, press the Enter key, followed by below prompt, then start SNMP configuration.

Configure SNMP

[0]: Config SNMP-server read-write community string

[1]: Config SNMP-server read-only community string

[2]: Config traps-host and community string

[3]: Config SNMP-server status

[4]: Config SNMP traps status

[5]: Add SNMP NMS security IP address

[6]: Exit

Selection number:

1. If select “0” in SNMP configuration menu, press the Enter key. The prompt is as follows:

   Please input the read-write access community string[private]:

Note: The length of read-write access community string must be in the range of 1~255 characters. The default is “private”. Enter a valid string, hit the Enter key to return to SNMP configuration menu.

2. If select “1” in SNMP configuration menu, press Enter, followed by below prompt:

   Please input the read-only access community string[public]:

Note: The length of read-only access community string must be in the range of 1~255 characters. The default is “public”. Enter a valid string, hit the Enter key to return to SNMP configuration menu.

3. If select “2” in SNMP configuration menu, press the Enter key, followed by below prompt:

   Please input traps-host IP address(A.B.C.D):

   Input a valid IP address of the host receiving Traps, press the Enter key. The prompt is as follows:

   Please input traps community string[public]:

Note: The length of traps community string must be in the range of 1~255 characters. the default is “public”. Enter a valid string, press the Enter key to return to SNMP configuration menu.

4. If select “3” in SNMP configuration menu, press the Enter key, followed below prompt:

   Enable SNMP-server? (y/n) [y]:

   If SNMP service is needed, please enter “y” or press Enter directly; if SNMP service is not required, please type “n”, press Enter to return to SNMP configuration menu.

5. If select “4” in SNMP configuration menu, press the Enter key, followed by below prompt:

   Enable SNMP-traps ? (y/n) [y]:

   If user wants switches to send messages to Traps, please type “y“or press Enter directly. If not, please type “n“, press Enter and return to SNMP configuration menu.

6. If select 5 in SNMP configuration mode, press the Enter key, followed by below prompt :

   Please input the new NMS IP address(A.B.C.D):

   Enter a valid and secure IP address of SNMP mangement station, press the Enter key to return to SNMP configuration menu.

7. If select 6 in SNMP configuration menu, return to Setup main menu

1.3.5 Exit from Setup Configuration Mode

Select “4” in the Setup main menu, user will exit from Setup configuration mode, but all configurations made in Setup configuration mode won’t be saved.

Select “5” in the Setup main menu, user will exit from Setup configuration mode and all configurations made in Setup configuration mode will be saved, which is equivalent to Write command. E.g. in Setup configuration mode, user sets Telnet user, enable Telnet service, select “5” to exit from Setup main menu, then user can use terminal to configure and manage switches by Telnet service.

After exiting from Setup configuration mode, enter CLI configuation interface. CLI configuration commands ans gramars will be introduced in detail in following chapters.

Chapter 2 Switch Management

2.1 Management Methods

After buying swithes, users need to configure them to achieve network management. SICOM6496 provides two ways of management : out-of –band management and in-band management.

2.1.1 Out-of-band Management

Out-of-band management is the management through CONSOLE interface. Generally, when switches are first configured or switches do not support in-band management, user will adopt out-of-band management. E.g. if user wishes to access switch through Telnet, switch IP address must be set at first through CONSOLE interface.

The steps of CONSOLE interface management are as follows.

2.1.1.1 Build up Environments

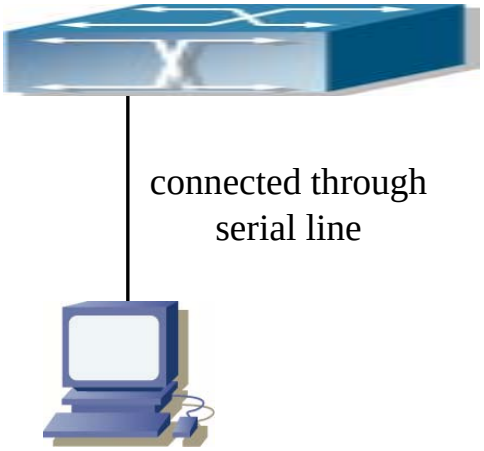


Figure 2-1 configuration environment of SICOM6496 out-of-band management

As shown in Figure 2-1, use serial line to connect PC serial port (RS-232) with the switch.

Device instructions:

Device Name	Description
PC	It has good Keyboard and RS232 serial port, and installs terminal emulation program, such as Windows 9x/NT/2000/XP's hyper terminal, etc
Serial line	One end of serial line connects with PC RS232 serial port, the other end links with CONSOLE interface of SICOM6496
SICOM6496	It has a good CONSOLE interface

2.1.1.2 Enter Hyper Terminal

After successful connection, open Windows system hyper terminal. Here is an example of opening Windows XP hyper terminal:

1. Click hyper terminal

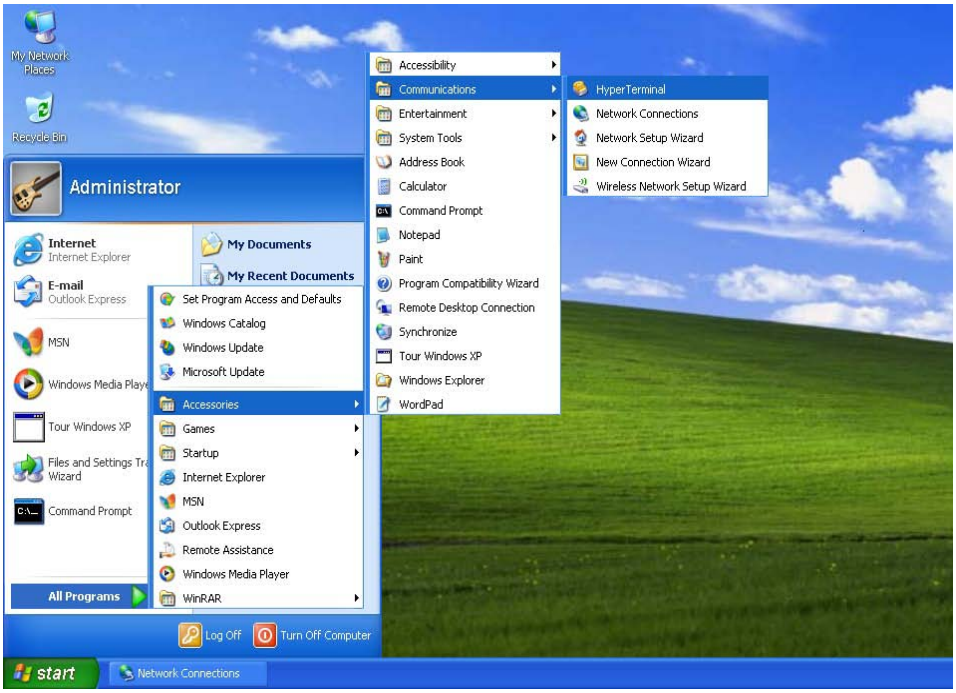


Figure 2-2 Open hyper terminal (1)

2. Type the name of hyper terminal, such as SICOM6496

Figure 2-3: open hyper terminal (2)

3. Select RS232 serial port (COM port) in “used when connection”, such as choosing COM1 when use serial port 1. Click “apply”

Figure 2-4: open hyper terminal (3)

On the COM1 Properties window, there are the following: set baud rate to 9600 bit/s , 8 data bit, no parity, 1 stop bit, no flow control; or directly click the button of “restore defaults”, then click “Apply”

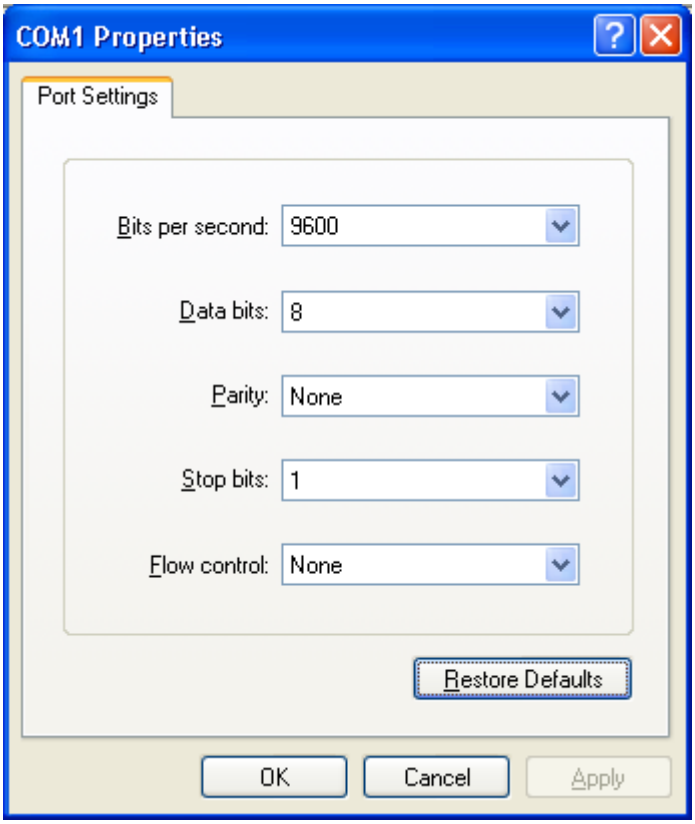


Figure 2-5: Open hyper terminal (4)

4. The configuration interface of hyper terminal is presented:

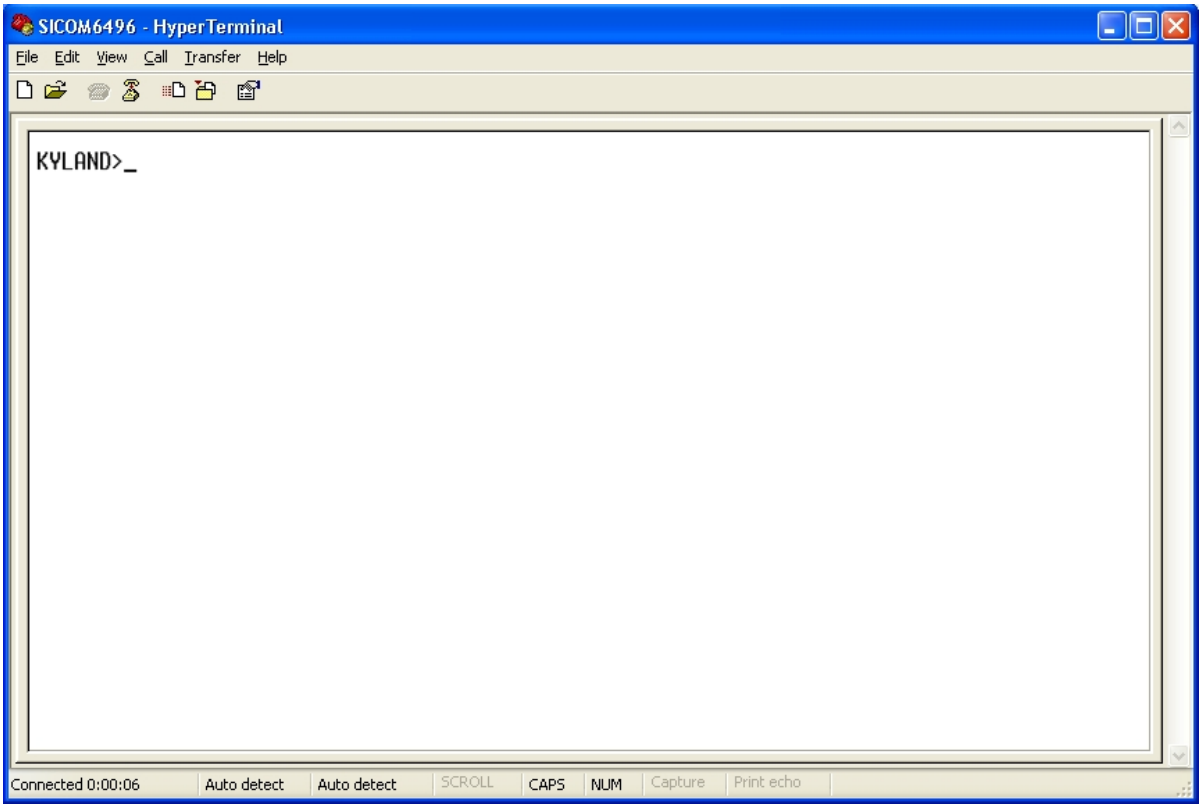


Figure 2-6: open hyper terminal (5)

2.1.1.3 Enter Switch CLI interface

Trun switch power on. The following prompt will be presented in hyper terminal configuration interface to enter CLI configuration mode of SICOM6496.

KYLAND

Copyright (c) 2004 by KYLAND

All rights reserved.

Testing RAM...

67,108,864 RAM OK.

Loading system...

Starting system...

KYLAND Series Switch Operating System, Version RW-0.0.38

Copyright (C) 2001-2004 KYLAND

http://www.kyland.com.cn

SICOM6496 Switch

KYLAND>

Then, user can type related commands to do management. The command details are introduced in following chapters.

2.1.2 In-band Management

In-band management is to log on switch through Telnet program, or to configure and manage switch through KYLAND's network management software Kyvision. In-band management make some devices connected with switch has switch management functions. When in-band management does not work caused by changes in switch configuration, it is able to use out-of-band management to operate configuration and management.

2.1.2.1 Switch Management through Telnet

The requirements for Telnet management:

1. Switch has been configured IP address.
2. The IP addresses of PC serving as Telnet user and the IP address of switch VLAN interface connected with PC should be in a same segment.
3. If not satisfying item 2, Telnet user can use router or other devices to reach a switch IP address.

SICOM6496 is a layer 3 switch which can set multi IP addresses. For more details, please refer to chapter 4.3. Here is an example: only VLAN1 exist in the system when switch leaves the factory

The steps of Telnet user Telnet to switch VLAN1 interface

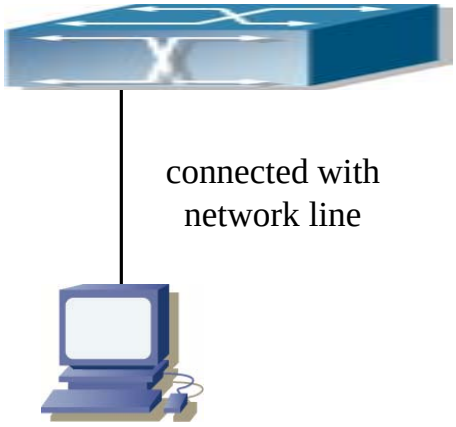


Figure 2-7: switch management through Telnet

Step 1: Configure switch IP address

Firstly, configure PC IP address which must be in a same segment with the IP address of switch VLAN1 interface connected with PC, such as the IP address of switch VLAN1 interface is 10.1.128.251, so the PC IP address can be set to 10.1.128.252. Operate "ping 10.1.128.251" command in the PC to check whether they can communicate. If not, please find out the reason.

A brief introduction of the commands of configuring SICOM6496 VLAN1 interface IP address. Before in-band management, configure switch IP address through CONSOLE Interface (out-of-band management), and the configuration commands are as follows: (all command prompts are "Switch" in switch configuration unless noted otherwise)

Switch>

Switch>en

Switch#config

Switch(Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip address 10.1.128.251 255.255.255.0

Switch(Config-If-Vlan1)#no shut

Step 2: run Telnet user program

Run Windlows Telnet user program and specify the destination address of Telnet.

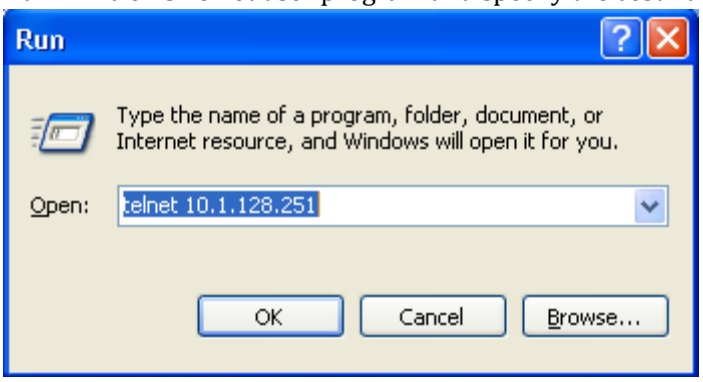


Figure 2-8: run Windows Telnet user program

Step 3: log on switch

Typing the correct login name and password to log on Telnet configuration interface, otherwise the access of this Telnet user will be denied. This measure is to protect switches against illegal operation of unprivilege user. If switches do not set authorized Telnet users, no user can enter switch CLI configuration interface, so when it is allowed to configure and manage switches through Telnet, use **Telnet-user *<user>* password {0|7} *<password>*** command in global configuration mode through Console interface to set Telnet privilege users and password for switch. For example, the privilege user name is **test**, and the password is plain **test**; the configuration mode is as follows:

Switch>en

Switch#config

Switch(Config)#Telnet-user test password 0 test

Typing correct login name and password in Telnet configuration interface, Telnet user can successfully enter switch CLI configuration interface. After login through Telnet, the used commands are the same as those used after login by CONSOLE interface

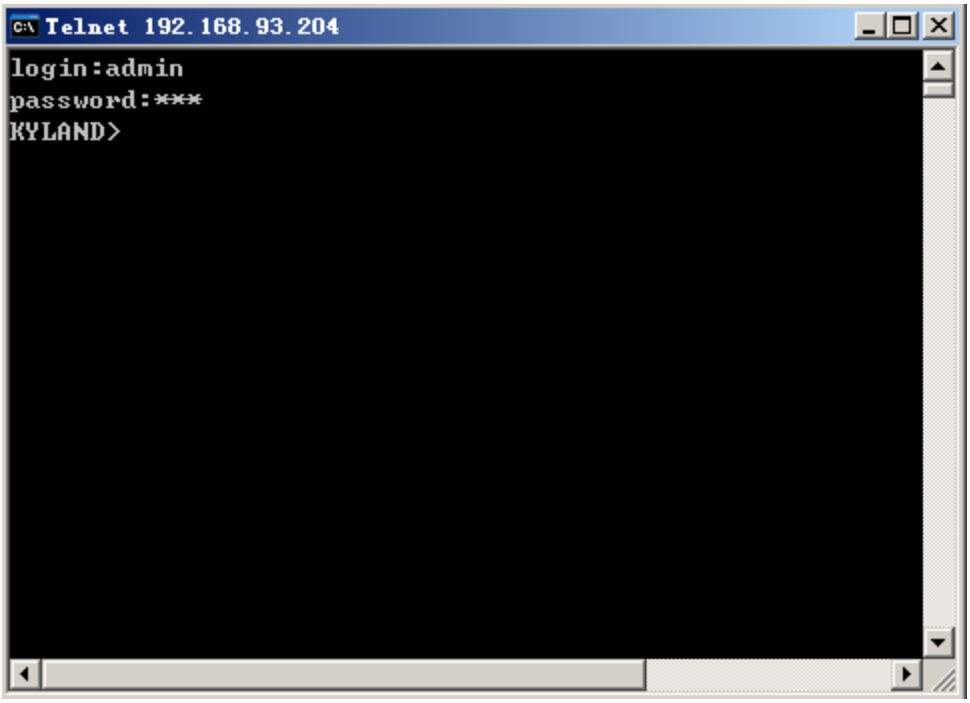


Figure 2-9: Telnet configuration interface

2.1.2.2 Switch Management through Kyvision

The requirements of switch management through Kyvision:

1. Switch has configured IP address.
2. The IP addresses of PC serving as Telnet user and the IP address of switch VLAN interface connected with PC should be in a same segment.
3. If not satisfying item 2, Telnet user can use router or other devices to reach a switch IP address.

The PC installing Kyvision network management software must be able to connect with switch IP address through ping command, so when running Kyvision, Kyvision can find SICOM6496 and perform read and write operation to it. About how to manage switch through Kyvision, please refer to Kyvision user manual.

2.2 Management Interface

SICOM6496 provides 3 types of management interfaces: CLI (Command Line Interface), web management interface and Kyvision network management software. We will introduce CLI interface in detail. About Kyvision, please go through Kyvision user manual.

2.2.1 CLI Interface

User are familiar with CLI interface. Aforementioned out-of-band management and Telnet login both use CLI interface to configure switch.

CLI interface, provided by Shell program, is composed of series configuration commands. Shell classifies these commands by their different functions on switch configuration. Different kinds of commands correspond to different configuration modes. The following article provides a detailed explanation of switch Shell features.

- Configuration mode

- Configuration grammar
- Shortcut key
- Help function
- A check made on input data
- Support incomplete match

2.2.1.1 Configuration Mode Introduction

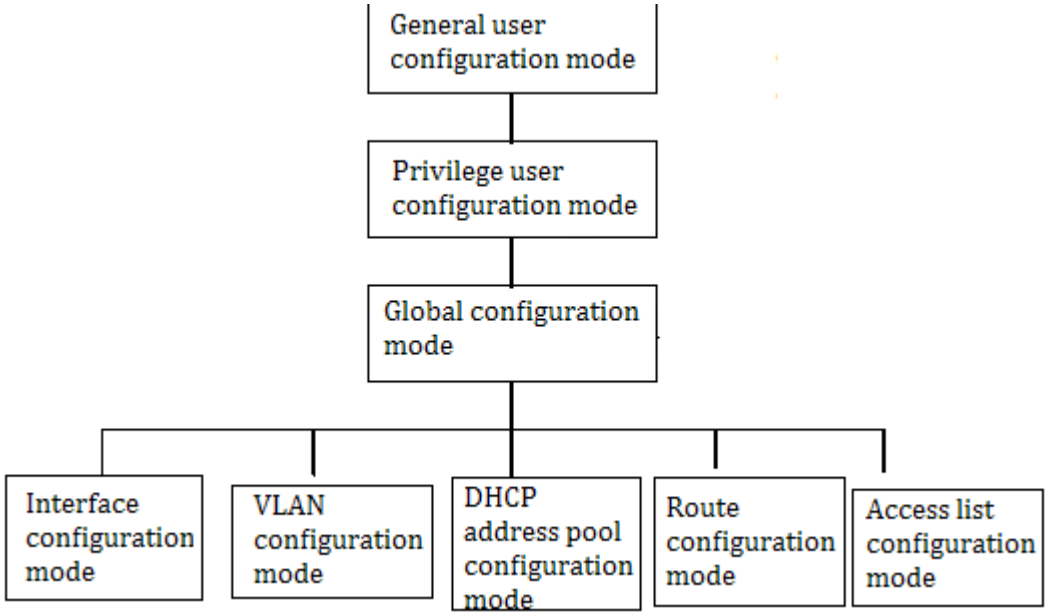


Figure 2-10 Shell configuration mode of SICOM6496

2.2.1.1.1 General User Configuration Mode

When users enter CLI interface, the first configuration mode they met is General User Configuration Mode with the prompt of "Switch>". ">" is always a prompt for general user configuration mode. When users use **exit** command in privilege user configuration mode to escape, they will return to general user configuration mode.

Usera are unable to configure switch in general user configuration mode in which users can only inquire switch clock and version information.

2.2.1.1.2 Privilege User Configuration Mode

In general user configuration mode, use **enable** command, input the privilege user password if it has been set to enter privilege user configuration mode **"Switch#"**. When users use **exit** command to exit from global configuration mode, they will also return to privilege user configuration mode. Moreover, SICOM6496 provides shortcut "Ctrl+z" to let switch in any configuration mode (except general user configuration mode) return to privilege user configuration mode.

In privilege user configuration mode, user is able to inquire switch configuration information, connection state of each port, statistics on received and transmitted data, etc. Besides, after entering privilege user configuration mode, users may enter global configuration mode to revise all switch configurations, so privilege user password must be set to avoid illegal use and malicious destroy of switch configuration from non-privilege user, leading to the loss.

2.2.1.1.3 Global Configuration Mode

In privilege user configuration mode, use **config** comamand to enter global configuration mode "**Switch(Config)#**". When in other configuration modes, such as interface configuration mode, VLAN configuration mode, users can use **exit** command to get back to global configuration mode.

In global configuration mode, users can make global configuration to switch, such as configuring MAC address table, port mirroring, creating VLAN, starting up IGMP Snooping, GVRP, STP, etc. Furthermore, user is able to configure each port by commands in global configuration mode.

2.2.1.1.3.1 Interface Configuration Mode

In global configuration mode, use command **interface** to enter interface configuration mode. SICOM6496 operation system provides 3 types of ports: 1. VLAN interface; 2. Ethernet port; 3. port-channel, so there are also three types of interface configuration modes.

Port type	Type of access	prompt	Functions	Type of exit
VLAN interface	In global configuration mode, type Command: **interface vlan *<Vlan-id>***。	**Switch(Config-If-Vlanx)#**	Configure switch IP, etc	Use command **exit** to return to global configuration mode
Ethernet port	In global configuration mode, type Command: **interface ethernet *<interface-list>***。	**Switch(Config-ethernetxx)#**	Configure Ethernet ports'duplex mode, speed,etc	Use command **exit** to return to global configuration mode
port-channel	In global configuration mode, type command **interface port-channel *<port-channel-number>***。	**Switch(Config-if-port-channelx)#**	Configure port-channel's dulexmode, speed,etc.	Use command **exit** to return to global configuration mode

2.2.1.1.3.2 VLAN Configuration Mode

In global configuration mode, use command **vlan *<vlan-id>*** to enter VLAN configuration mode. In VLAN configuration mode, user can configure the members of ports in the VLAN. Operate **exit** command to return to global configuration mode.

2.2.1.1.3.3 DHCP Address Pool Configuration Mode

In global configuration mode, use **ip dhcp pool *<name>*** command to enter DHCP address pool configuration mode "**Switch(Config-<name>-dhcp)#**". In this mode, user can configure the properties of DHCP address pool. Operate **"exit"** command to return to global configuration mode.

2.2.1.1.3.4 Routing Configuration Mode

Routing Protocol	Access Method	Prompt	Functions	Exit Method
RIP Routing Protocol	In global configuration mode, input command **router rip**	**Switch(Config-Router-Rip)#**	Configure RIP protocol parameters	Operate command **"exit"** to return to global configuration mode
OSPF Routing Protocol	In global configuration mode, input command **router ospf**	**Switch(Config-Router-Ospf)#**	Configure OSPF protocol parameters	Operate command **"exit"** to return to global configuration mode

2.2.1.1.3.5 Access List Configuration Mode

Type of access list	Access method	Prompt	Functions	Exit Method
Standard IP Access List configuration mode	In global configuration mode, enter command **ip access-list standard**	**Switch(Config-Std-Nacl-a)#**	Configure standard access list parameters	Operate command **"exit"** to return to global configuration mode
Extended IP Access List configuration mode	In global configuration mode, enter command **ip access-list extended**	**Switch(Config-Ext-Nacl-b)#**	Configure extended access list parameters	Operate command **"exit"** to return to global configuration mode

2.2.1.2 Grammar Configuration

SICOM6496 provides various configuration commands for users. Although the types of these configuration commands are different, they all follow SICOM6496 configuration command grammars. The general command formats offered by switch are as follows:

cmdtxt *<variable>* { enum1 | ... | enumN } [option]

Grammar explanation: **cmdtxt** means key word of command; ***<variable>*** means that the parameter

is a variable; **{enum1 | ... | enumN }** means that the parameter must be chosen from the group of **enum1**~**enumN**; in **[option]**, "**[ ]**" means that this parameter is optional. Symbols "**< >**", "**{ }**", "**[ ]**" are used together in lots of commands, such as **[<*variable*>]**，**{enum1 <*variable*>| enum2}**，**[option1 [option2]]**, etc

Next is specific ananalysis on some kinds of configuration command grammars:

- **show version**: no parameter; it only has keywords; just type the command directly
- **vlan<vlan-id>**: after typing key words, corresponding parameters are also needed
- **duplex {auto|full|half}**: for this kind of command, user may input "duplex half" or "duplex full" or "duplex auto"
- **snmp-server community {ro|rw} <string>**: with following situations
  snmp-server community ro <string>
  snmp-server community rw <string>

2.2.1.3 Support Shortcuts

For user easy configuration, SICOM6496 provides shortcuts, such arrow keys (up, down, left, right), Backspace, etc. If hyper terminal can't identify up and down keys, user can use ctrl+p and ctrl+n to replace them.

.

Key	Function
BackSpace	Delete the preceding character and the cursor move forward
"↑"	Display previous commands with max 10 commands
"↓"	display next command. When cursor is in one of the previous commands, use "↓" to move cursor to its next command
"←"	move cursor left one character
"→"	move cursor right one charatcer
Ctr+p	it is equivalent to "↑"
Ctr+n	it is equivalent to "↓"
Ctr+b	it is equivalent to "←"
Ctr+f	it is equivalent to "→"
Ctr+z	in other configuration modes (except general user configuration mode), use this to directly return to privilege user configuration mode
Ctr+c	interrupt the process of switch ping command or other running commands
Tab	when the input string can show command and keyword without collision, press Tab key to complete the command or keyword.

2.2.1.4 Help Function

SICOM6496 offers two methods for users to get help information: one is "help" command, and the other is "?".

Help	Usage and functions
Help	In any command mode, enter "help" command to get a brief introduction of help system
"?"	1. In any command mode, input "?" to obtain all commands in this mode

	and their brief introductions 2. Type "Space+?" after command keywords. If it is a parameter in the position of "?", system will output the descriptions of parameter type, range, etc. if it is a key word in this pisition, it will list a set of this keyword and their brief introductions. If it is "<cr>", it means that this command is completed, so just type "Enter". 3. Directly input "?" after a string, it will list all commands with the same beginning of this string.

2.2.1.5 A Check Made on Input Data

2.2.1.5.1 the returned information if succeed

All commands input through keyboard will accept Shell grammar checking. If user correctly enter the command and it is operated successfully, no information is presented.

2.2.1.5.2 the returned information if fail

Error information	Reason
Unrecognized command or illegal parameter!	The command does not exist or something wrong in parameter's range, type and format
Ambiguous command	There are at least two different explanations on your input
Invalid command or parameter	Command analysis is successful, but there is no effective parameter record
This command is not exist in current mode	The command can be analyzed, but it can't be configured in current mode
Please configurate precursor command "*" at frist !	The current input can be correctly analyzed, but its preceding command has not been configured.
syntax error : missing '"' before the end of command line!	Quotation marks are used in the command, but one of marks is missing

2.2.1.6 Support Incomplete Match

SICOM6496 Shell supports imcompletely matched searching commands and key words. When input commands and keywords without collision, Shell will correctly analyze them. For example:

1. For privilege users, configuring "show interface ethernet 1/1" command, they just need to input "sh in e 1/1"
2. For privilege users, configuring "show running-config" command, if they only input "sh r", system will inform "> Ambigous command!" because Shell couldn't ensure that "show r" command is "show rom" or "show running-config", so users must input "sh ru" to get correct analaysis.

2.2.2 WEB Interface

SICOM6496 provides HTTP web management function. User can configure switch and detect switch working status through WEB interface.

Perform following operations to achieve switch management through WEB interface.

1. Configure valid IP address, mask, default gateway for switch as chapter 5.3
2. Configure management user and user password
3. Connect switch through WEB browser, input user name, password, then you can manage the switch through WEB interface

2.2.2.1 WEB Command Introduction

2.2.2.1.1 ip http-server

Command: **ip http-server**

no ip http-server

Function: enable switch WEB management function; no command is to disable switch WEB management function

Default: WEB management is enabled.

Command mode: global configuration mode

User guide: this command can only be used in CONSOLE. Administrator can use this command to permit or deny login to switch though Web browser

Example: disable switch WEB function
SWITCH(Config)#no ip http-server

2.2.2.1.2 ip address

Command: **ip address *<ip-address>* *<mask>* [secondary]**

no ip address [*<ip-address>* *<mask>*] [secondary]

Function: set the IP address and mask of switch designated VLAN interface; no command is to delete this IP address configuration.

Parameter: ***<ip-address>*** is a IP address with dot-decimal format; ***<mask>*** is a subnet mask with dot-decimal format; **[secondary]** means that the IP address is a secondary IP address.

Default: switch doesn't have IP address when leaving factory.

Command mode: VLAN interface configuration mode

User guide: If user wants to configureIP address for a switch, please create a VLAN interface at first.

Example: set IP address of VLAN1 interface to 192.168.0.2.
SWITCH(Config)#interface vlan 1
SWITCH(Config-If-Vlan1)#ip address 192.168.0.2 255.255.255.0
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#

Relative Command: **ip bootp-client enable, ip dhcp-client enable**

2.2.2.1.3 web-user

Command: **web-user <username> password {0|7} <password>**

no web-user <username>

Function: set the user name and password for user login through WEB browser; no command is to delete this user

Parameter: ***<username>*** is the user name for login through WEB browser with max 16 characters; ***<password>*** is a login password with max 8 characters; 0|7respectively indicate an unencrypted

passwrrd and a encrypted password.

Command mode: global configuration mode

Default: there are not username and password for login through Web browser

User guide: use this command to set authorized WEB user. If don't set authorized WEB user, no user can configure switch through WEB browser.

Example: set a user with the name "admin" and password "123"
SWITCH(Config)#web-user admin password 0 123

2.2.2.2 WEB Homepage

After entering user name, password and they pass authentication, you will see below WEB management homepage. Click links in main menu to view and configure management sublinks.

Figure 2-11 WEB management homepage

Chapter 3 Switch Basic Configuration

3.1 Basic Configuration Commands

The basic configuration of switch contains the commands to access and exit from privilege user mode, to access and exit from interface configuration mode, to set and display switch clock, to display switch system version information, etc.

3.1.1 Clock set

Command: **clock set *<HH:MM:SS> <YYYY.MM.DD>***

Function: set system date and time

Parameter: ***<HH:MM:SS >*** is current time. ***HH*** is in the range of 0~23; ***MM*** and ***SS*** are in the range of 0~59. ***< YYYY.MM.DD >*** is current date, including year, month and day. ***YYYY*** is in the range of 1970~2100; ***MM*** is in the range of 1~12; ***DD*** is in the range of 1~31.

Command mode: privilege user configuration mode

Default: system date and time is Jan. 1, 2001, 0: 0: 0

User guide: switch can't keep measuring time when power off, so current date and time must be set at first when switch will be used in an environment which has strict requirements on accurate time.

Example: setting the date and time of switch to Aug. 1, 2002, 23:0:0

SWITCH#clock set 23:0:0 2002.8.1

Related Command: **show clock**

3.1.2 config

Command: **config [terminal]**

Function: from privilege user configuration mode to global configuration mode

Parameter: **[terminal]** means making terminal configuration

Command mode: privilege user configuration mode

Example: SWITCH#config

3.1.3 enable

Command: **enable**

Function: use **enable** command to enter privilege user configuration mode from general user configuration mode

Command mode: general user configuration mode

User guide: In order to avoid non-privilege user's illegal access, user security authentication is required when entering privilege user configuration mode from general user configuration mode. The authentication is that users need to type correct privilege user password. After that, users enter privilege user configuration mode. If continuously input incorrect password 3 times, general user configuration mode remains unchanged. Use command "**enable password**" in global configuration mode to set privilege user password.

Example:

SWITCH>enable

password: ***** (admin)

SWITCH#

Related Command: **enable password**

3.1.4 enable password

Command: **enable password**

Function: change the password of accessing privilege user configuration mode from general user

configuration mode. Type this command and press "Enter" directly, then ***<Current password>*** ,***<New password>*** parameters are displayed, which need to be configured

Parameter: ***<Current password>*** is the original password with max 16 characters; ***<New password>*** is a new password with max 16 characters; ***<Confirm new password>*** is to confirm the new password which should be the exact same as new password, otherwise, password need to be reconfigured.

Command mode: global configuration mode

Default: privilege user password is empty. When users configure the password for the first time, just press "Enter" when system give you a message to enter origimal password.

User guide: privilege user password configuration is to avoid non-privilege user's illegal access. We recommend that setting privilege user password when network administrator make first configuration for switch. Moreover, if administrator will keep away from the terminal screen for a long time, please operate "exit" command to exit from privilege user configuration mode.

Example: set privilege user password to admin

SWITCH(Config)#enable password

Current password: (in the first configuration, no password, press "Enter" directly)

New password:***** (set new password to admin)

Confirm new password:***** (confirm new password admin)

SWITCH(Config)#

Related Command: **enable**

3.1.5 exec timeout

Command: **exec timeout *<minutes >***

Function: set the timeout to exit form privilege user configuration mode

Parameter: ***< minute >*** is a time value with the unit of minute and in the range of 0~300.

Command mode: global configuration mode

Default: 5 minutes

User guide: in order to ensure the security of switch and avoid illegal user's malicious operation, system start to measure time when privilege user finish their configuration, and when the time reach the setting timeout, system will automatically exit from privilege user configuration mode. If user wants to enter privilege user configuration mode again, please re-enter privilege user password. If exec timeout is set to 0, it means that system won't exit from privilege user configuration mode,

Example: set the timeout of switch exiting from privilege user configuration mode to 6 minutes

SWITCH(Config)#exec timeout 6

3.1.6 exit

Command: **exit**

Function: exit from current mode and return to previous mode, such as use this command to exit from global configuration mode and return to privilege user configuration mode, use this command to exit from privilege user configuration mode and return to general user configuration mode, etc.

Command mode: all configuration modes

Example:

SWITCH#exit

SWITCH>

3.1.7 help

Command: **help**

Function: output a brief introduction of command help system

Command mode: all configuration modes

User guide: switch provides online help at any moment and place. “help” command is to indicate the information about whole help system including full help, partial help. User can type “?” to obtain online help at any moment and place.

Example;

SWITCH>help

enable	-- Enable Privileged mode
exit	-- Exit Telnet session
help	-- help
show	-- Show running system information

3.1.8 ip host

Command: **ip host *<hostname> <ip_addr>***

no ip host *<hostname>*

Function: set host-to-IP address mapping relationship; no command is to delete this mapping relation.

Parameter: ***<hostname>*** is a hostname with max 15 characters. ***<ip_addr>*** is the corresponding IP address of hostname with dot-decimal format.

Command mode: global configuration mode

User guide: setting a corresponding relation of host and IP address, which can be used in commands, such as “**ping <host>**”

Example: set IP address of a host with the name of beijing to 200.121.1.1

SWITCH(Config)#ip host beijing 200.121.1.1

Related Command: **Telnet, ping, traceroute**

3.1.9 hostname

Command: **hostname *<hostname>***

Function: set the prompt in switch CLI interface

Parameter: ***<hostname>*** is a string of prompt with max 30 characters

Command mode: global configuration mode

Default: the prompt is “KYLAND”.

User guide: use this command to set switch CLI prompt according to actual conditions.

Example: setting prompt to Test

SWITCH(Config)#hostname Test

Test(Config)#

3.1.10 reload

Command: **reload**

Function: hot-start switch

Command mode: privilege user configuration mode

User guide: user can use this command to restart when power doesn't cut off

3.1.11 set default

Command: **set default**

Function: restore switch factory defaults

Command mode: privilege user configuration mode

User guide: restore switch factory settings. all configurations user made to switch are deleted and after restarting the switch, the prompt appeared is the same as the one when switch was powered on for the first time.

Note: after configuring this command, user must operate **write** command. After saving configuration, restart the switch, then it restore to factory defaults.

Example:

SWITCH#set default

Are you sure? [Y/N] = y

SWITCH#write

SWITCH#reload

3.1.12 setup

Command: **setup**

Function: enter switch Setup configuration mode

Command mode: privilege user configuration mode

User guide: SICOM6496 provides Setup configuration mode. User can configure IP address, etc in Setup configuration mode.

3.1.13 language

Command: **language {chinese|english}**

Function: set the language of help information

Parameter: **Chinese** and **English**

Command mode: privilege user configuration mode

Default: English

User guide: SICOM6496 displays help information in 2 languages. User can choose according to their own requirements. Help information is in English after system is restarted,

3.1.14 write

Command: **write**

Function: save all running configuration parameters to Flash Memory

Command mode: privilege user configuration mode

User guide: when finish a set of configurations and they accomplish their intended results, save the current configuration to Flash, so that system can automatically restore all factory settings when switch is powered off or shut down carelessly. This command is equivalent to **copy running-config**

startup-config command.

Related commands: **copy running-config startup-config**

3.2 Maintenance and Debugging Commands

When users configure switch, they want to check if all configuration are right and if switch run well, or they need fault diagnosis when network meets problems, SICOM6496 provides various debugging commands, such as ping, Telnet, show, debug, etc. to help user check system configuration, operation status, and discover the cause of the trouble.

3.2.1 ping

Command: **ping [<*ip-addr*>]**

Function: switches send ICMP request packets to remote devices to check if aisles between switch and remote devices are unobstructed.

Parameter: ***<ip-addr>*** is the IP address of the Ping destination host with dot-decimal format

Default: send 5 ICMP request packets with the size of 56 byrtes and the timeout of 2 seconds

Command mode: privilege user configuration mode

User guide: input "ping" command, press "Enter" directly, and system provides a interactive configuration mode for users who can define ping parameters by themselves.

Example:

Example 1: use the defaults of ping program

SWITCH#ping 10.1.128.160

Type ^c to abort.

Sending 5 56-byte ICMP Echos to 10.1.128.160, timeout is 2 seconds.

...!!

Success rate is 40 percent (2/5), round-trip min/avg/max = 0/0/0 ms

In above example, switch sends ping command to a device with IP address of 10.1.128.160. If the switch doesn't receive corresponding ICMP response packets of the first three ICMP request packets in the default timeout of 2 seconds, it means that ping fails, but the last two packet get responses with the successful rate of 40%. Switch uses "." to indicate ping failure and link disconnection; use "!" to say ping success and link connection.

Example 2: use the methods provided by ping program to modify ping parameters

SWITCH#ping

protocol [IP]：

Target IP address：10.1.128.160

Repeat count [5]：100

Datagram size in byte [56]：1000

Timeout in milli-seconds [2000]：500

Extended commands [n]：n

Information	Explanation

protocol [IP]：	Select Ping for IP protocol
Target IP address：	The IP address of the destination device
Repeat count [5]	The number of the sending packets; the default is 5
Datagram size in byte [56]	The size of ICMP packet with the default of 56byte
Timeout in milli-seconds [2000]：	The timeout with the unit of millisecond and the default is 2 seconds
Extended commands [n]：	

3.2.2 Telnet

3.2.2.1 Telnet Introduction

Telnet remote login is a simple remote terminal protocol. By Telnet, user can log on a remote host with IP address or host name through TCP connection. Telnet can send user's keystrokes to remote host and meanwhile return the output of remote host to user's screen through TCP connection. This service is transparent because user feel that keyboard and screen are directly connected with remote host.

Telnet adopts user-server mode. The local system is Telnet user and remote host is Telnet server. SICOM6496 can serve as Telnet server and Telnet user.

When SICOM6496 works as Telnet server, user can Telnet SICOM6496 through Telnet user software of Windows or other operation system. As we introduced in-band management in previous chapter, SICOM6496, working as Telnet server, can establish TCP connection with max 5 Telnet users at the same time.

When SICOM6496 serves as a Telnet user, use Telnet command in switch privilege user configuration mode to log on other remote host. SCIOM6496, serving as Telnet user, can establish TCP connection with only one remote host. If switch wants to connect with other remote host, pleae disconnect current TCP connection at first.

3.2.2.2 Task Sequence of Telnet

1. Telnet server configuration
2. Switch Telnet remote host

1. Telnet server configuration

Command	Explanation
Global configuration mode	
Telnet-server enable **no Telnet-server enable**	Enable Telnet server function; no command is to disable Telnet server function
Telnet-user ***<user-name>*** **password {0|7}** ***<password>*** **no Telnet-user** ***<user-name>***	Configure the user name and password to Telnet switch; no command is to delete authorized Telnet user
Telnet-server securityip ***<ip-addr>***	Configure secure IP address for Telnet

no Telnet-server securityip *<ip-addr>*	switch; no command is to delete authorized Telnet secure addresses
Privilege mode	
monitor **no monitor**	Let switch Telnet user display debugging information; no command is to close this function.

2. Switch Telnet remote host

Command	Explanation
Privilege mode	
Telnet [<*ip-addr*>] [<*port*>]	Use switch Telnet users to log on remote host

3.2.2.3 Telenet Command Introduction

3.2.2.3.1 monitor

Command: **monitor**

no monitor

Function: enable Telnet user to show debugging information and close the function of showing debugging information at Console interface; no command is to disable Telnet user to show debugging information and resume the function of showing debugging information at Console interface.

Command mode: privilege user configuration mode

User guide: Generally when Telnet user access switch, if open Debug information, it won't be displayed in Telnet interface, but displayed in hyper terminal connected with Console interface. Use this command to make debugging information displayed in designated Telnet terminal interface, but not in Console or other Telnet terminal interface.

Example: enable Telnet user to show debugging information

SWITCH#monitor

Related Command: **Telnet-user**

3.2.2.3.2 Telnet

Command: **Telnet [<*ip-addr*>] [<*port*>]**

Function: log on a remote host with IP address of ***<ip-addr>*** in the form of Telnet

Parameter: ***<ip-addr>*** is the IP address of remote host with dot-decimal format. ***<port>*** is the port number in the range of 0~65535.

Command mode: privilege user configuration mode

User guide: when switch works as Telnet user, user can use this command to login to remote host to make configuration. When switch serves as Telnet user, it can establish TCP connection with only one remote host. If it wants to connect with other remote host, please cut off the current TCP connection at first. Shortcut "CTRL+ |" canbe used to achieve disconnection.

Directly enter keyword **Telnet** without other parameter, then user will enter Telnet configuration mode.

Example: switch Telnet the remote router KYLNAD with IP address of 20.1.1.1.

SWITCH#Telnet 20.1.1.1 23

Trying 20.1.1.1...

Service port is 23

Connected to 20.1.1.1

login:123

password:***

KYLAND>

3.2.2.3.3 Telnet-server enable

Command: **Telnet-server enable**

no Telnet-server enable

Function: enable Telnet server function of switch; no command is to disable Telnet server function of switch

Default:enable Telnet server function

Command mode: global configuration mode

User guide: this command can be used only at CONSOLE. Administrator use this command to permit or deny Telnet users to log on switch.

Example: disable switch Telnet server function

SWITCH(Config)#no Telnet-server enable

3.2.2.3.4 Telnet server security ip

Command: **Telnet-server securityip *<ip-addr>***

no Telnet-server securityip *<ip-addr>*

Function: when switch works as Telnet server, use this command to configure a secure ip address of Telnet user which is allowed to login; no command is to delete the secure IP address of designated Telnet user

Parameter: ***<ip-addr>*** is a secure IP address with dot-decimal format which is permitted to access switch

Default: no secure IP address

Command mode: global configuration mode

User guide: Before setting secure IP addresses, there is a limit to the IP address of switch Telnet user. After the secure IP address configuration, only the host with a secure ip address can Telnet switch to make configuration. Switch allows to configure multiple secure IP addresses.

Example: setting 192.168.1.21 to a secure IP address

SWITCH(Config)#Telnet-server securityip 192.168.1.21

3.2.2.3.5 Telnet –user

Command: **Telnet-user *<username>* password {0|7} *<password>***

no Telnet-user *<username>*

Function: set the user name and password of Telnet user; no command is to delete this Telnet user.

Parameter: ***<username>*** is the name of a Telnet user with max 16 characters; ***<password>*** is the

password with max 8 characters.; **0|7** respectively indicated a unencrypted password and a encrypted password.

Command mode: global configuration mode

Default: no setting username and password for Telnet user

User guide: this command is used when switch serves as Telnet server. use this command to set authorized Telnet user. If doesn't set authorized Telnet user, no Telnet user can configure switch through Telnet. When switch works as Telnet server, it can establish TCP connection with max 5 Telnet users at the same time.

Example: set a Telnet user with the name of Antony and password of switch

SWITCH(Config)#Telnet-user Antony password 0 switch

3.2.3 traceoute

Command: **traceroute {<*ip-addr*> | host <*hostname*> }[hops <*hops*>] [timeout <*timeout*>]**

Function: this command is userd to test the number of gateways which the data packages has passed through from the source device to the destination device and check if the network is unobstructed and locate network failures.

Parameter: ***<ip-addr>*** is the IP address of destination host with dot-decimal format. ***<hostname>*** is the name of remote host. ***<hops>*** means the max number of gateways which Traceroute has passed through. ***<timeout>*** is a timeout of packets with the unit of millisecond and in the range of 100~10000.

Default: the max number of gateways is 16 with timeout of 2000ms

Command mode: privilege user configuration mode

User guide: Traceroute is generally used to locate the faults when aisles to destination network are not unobstructed.

Related Command: **ip host**

3.2.4 show

show command is to show switch system information, port information, protocol operation status, etc.. This chapter introduces the show command to show system information. Other show commands will be introduced in other chapters.

3.2.4.1 show colock

Command: **show clock**

Function: show system current clock

Command mode: privilege user configuration mode

User guide: user can check system date and time by this command. If system time is wrong, user can adjust it in time.

Example:

SWITCH#show clock

Current time is TUE AUG 22 11：00：01 2002

Related Command: **clock set**

3.2.4.2 show debugging

Command: **show debugging**

Function: show the state of debugging switch

User guide: if user want to check which debugging switches are ON, use can operate **show debugging** command

Command mode: privilege user configuration mode

Example: check which debugging switches are ON at present

```
SWITCH#show debugging
STP:
        Stp input packet debugging is on
        Stp output packet debugging is on
        Stp basic debugging is on
SWITCH#
```

Related Command: **debug**

3.2.4.3 show flash

Command: **show flash**

Function: show the files which are saved in flash and their size

Command mode: privilege user configuration mode

Example: check the files in flash and their size

```
SWITCH#show flash
boot.rom                    329,828 1900-01-01 00:00:00 --SH
boot.conf                        94 1900-01-01 00:00:00 --SH
nos.img                   2,449,496 1980-01-01 00:01:06 ----
startup-config                2,064 1980-01-01 00:30:12 ----
```

3.2.4.4 show history

Command: **show history**

Function: show the history commands recently entered

Command mode: privilege user configuration mode

User guide: system can save max 10 recently entered commands. User can use up and down cursors or their equivalent shortcuts (ctrl+p and ctrl+n) to access history commands.

Example:

```
SWITCH#show history
enable
config
interface ethernet 1/3
enable
show flash
show ftp
```

3.2.4.5 show memory

Command: **show memory**

Function: show the contents in designated memory area

Command mode: privilege user configuration mode

User guide: this command is for switch debugging. Command is in a interactive way to prompt user to input the memory address and output words of displayed information which include 3 parts: address, hexadecimal information and characters.

Example:

```
SWITCH#show memory
start address : 0x2100
number of words[64]:

002100:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
002110:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
002120:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
002130:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
002140:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
002150:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
002160:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
002170:   0000 0000 0000 0000   0000 0000 0000 0000   *................*
```

3.2.4.6 show running-config

Command: **show running-config**

Function: showing the efficient switch parameter configuration in current operating status

Default: for the configuration parameters which are taking effect, if they are the same as the default parameters, they won't be displayed.

Command mode: privilege user configuration mode

User guide: when finishing a set of configuration, user need to verify if configurations are correct, by operating **show running-config** command to check currently efficient parameters.

Example:

```
SWITCH#show running-config
```

3.2.4.7 show startup-config

Command: **show startup-config**

Function: show switch parameter configurations which are written in Flash Memory in current operation state. These configurations generally are the configuration files for switch startup the next time.

Default: If the configuration parameters read from Flash are the same as default parameters, they are not displayed.

Command mode: privilege user configuration mode

User guide: the difference between **show running-config** and **show startup-config** is that when user finish a set of configurations, users can see the increase of configuration through **show running-config**, but they can't see any configuration through **show startup-config**. But if user use **write** command to save the efficient configurations to Flash Memory, the displayed results are the same through **show running-config** and **show startup-config**

3.2.4.8 show switchport interface

Command: **show switchport interface [ethernet <interface-list>]**

Function: show switch ports' VLAN port mode, VLAN number and Trunk port information

Parameter: ***<interface-list>*** is port number or port list.

Command mode: privilege user configuration mode

Example: show VLAN information of port ethernet 1/1
SWITCH#show switchport interface ethernet 1/1
Ethernet1/1
Type :Universal
Mac addr num :-1
Mode :Access
Port VID :1
Trunk allowed Vlan :ALL

Contents	Description
Ethernet1/1	Corresponding Ethernet port number
Type	Current port type
Mac addr num	The number of MAC addresses which current port can learn
Mode :Access	VLAN mode of current port
Port VID :1	VLAN number of current port
Trunk allowed Vlan :ALL	ALL VLANs whichTrunk allow

3.2.4.9 show tcp

Command: **show tcp**
Function: show the current sate of TCP connection established with switch

Command mode: privilege user configuration mode

Example:
Switch#show tcp

LocalAddress	LocalPort	ForeignAddress	ForeignPort	State
0.0.0.0	23	0.0.0.0	0	LISTEN
0.0.0.0	80	0.0.0.0	0	LISTEN

content	description
LocalAddress	Local address in tcp connection
LocalPort	Local port number in tcp connection
ForeignAddress	The address of the other end in tcp connection
ForeignPort	The port number of the other end in tcp connection
State	The current state of tcp connection

3.2.4.10 show udp

Command: **show udp**
Function: show the current state of UDP connection established with switch

Command mode: privilege user configuration mode

Example:

SWITCH#show udp

LocalAddress	LocalPort	ForeignAddress	ForeignPort	State
0.0.0.0	161	0.0.0.0	0	CLOSED
0.0.0.0	123	0.0.0.0	0	CLOSED
0.0.0.0	1985	0.0.0.0	0	CLOSED

contents	description
LocalAddress	Local address in UDP connection
LocalPort	Local port number in UDP connection
ForeignAddress	The address of the other end in UDP connection
ForeignPort	The port number of the other end in UDP connection
State	The current state of UDP connection

3.2.4.11 show Telnet login

Command: **show Telnet login**

Function: show Telnet user information in switch established Telnet connection

User guide: this command is used to check the information of remote user which login to system

Example:

SWITCH#show telnet login

Antony

SWITCH#

3.2.4.12 show Telnet user

Command: **show Telnet user**

Function: show the information of Telnet user which has been authorized to visit switch through Telnet

User guide: this command is used to check the information of all authorized Telnet users

Example:

SWITCH#show telnet user

Antony

Related Command: **Telnet-user password**

3.2.4.13 show version

Command: show version

Function: show the information of switch version

Command mode: privilege user configuration mode

User guide: use this command to check switch version information, including hardware version and software version information

Example:

SICOM6496 Device, Sep 8 2004 08:59:51

HardWare version is 2.0, SoftWare version is RW-1.2.6.0, BootRom version is 1.2.7
Copyright (C) 2001-2002 by KYLAND.
All rights reserved.

3.2.5 Debug

Each protocol which switch supports has corresponding debug command. User can use debug command to diagnose network failures. In later chapters, debug commands will be introduced one by one in their corresponding parotocol.

3.3 Switch IP address Configuration

All SICOM6496 Ethernet ports are default as layer 2 (Data Link Layer) ports, performing layer 2 forwarding. VLAN interface represents the layer 3 interface function of a VLAN, and it can configure IP address which is also switch IP address. All configuration commands related to VLAN interface can be set in VLAN interface mode.

SICOM6496 provides 3 methods of IP address configuration.

- Manual configuration
- Bootp
- DHCP

Manual configuration is that user specifies a IP address for switch

BootP/DHCP is that switch serves as BootP/DHCP client and send BootPRequest broadcast packets to BootP/DHCP server to apply an address. When BootP/DHCP server get the requests, it will distribute address to switch. Besides, SICOM6496 also supports DHCP server function which can dynamicly distribute network parameters to DHCP client, suh as IP address, gateway address and DNS server address, etc

3.3.1 Task sequence of switch IP address configuration

1. manual configuration
2. BootP
3. DHCP

1. manual configuration

Command	Expalanation
ip address *<ip_address>* *<mask>* [secondary] **no ip address *<ip_address>* *<mask>* [secondary]**	Configure the IP address of switch VLAN interface; no command is to delete the IP address of switch VLAN interface

2. BootP

command	explanation
ip bootp-client enable **no ip bootp-client enable**	Enable switch BootP Client. Obtain IP address and gateway address through BootP negotiation; no command is to disable BootP Client function

3. DHCP

command	explanation
ip dhcp-client enable **no ip dhcp-client enable**	Enable switch DHCP Client. Obtain IP address and gateway address through DHCP negotiation; no command is to disable DHCP Client function

3.3.2 Switch IP Address Configuration Commands

3.3.2.1 ip address

Command: **ip address *<ip-address>* *<mask>* [secondary]**

no ip address [*<ip-address>* *<mask>*] [secondary]

Function: set IP address and mask of switch designated VLAN interface; no command is to delete the IP address configuration

Parameter: ***<ip-address>*** is the IP address with dot-decimal format. ***<mask>*** is the subnet mask with dot-decimal format. **[secondary]** means the IP address is a secondary IP address.

Default: switch doesn't have IP address

Command mode: VLAN interface configuration mode

User guide: if user wants to configure switch IP address, please create a VLAN interface at first.

Example: set the IP address of VLAN interface to 10.1.128.1/24.

```
SWITCH(Config)#interface vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.128.1 255.255.255.0
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#
```

Related Command: **ip bootp-client enable, ip dhcp-client enable**

3.3.2.2 ip bootp-client enable

Command: **ip bootp-client enable**

no ip bootp-client enable

Function: set switch to be BootP Client. Obtain IP address and gateway address through BootP negotiation; no command is to disable BootP Client function and release IP address and gateway address obtained by BootP

Default: disable BootP Client function

Command mode: VLAN interface configuration mode

User guide: obtaining IP address through BootP and through manual configuration or DHCP are mutually exclusive. Opening two IP address obtaining methods at the same time are not allowed.

Example: obtain IP address through BootP

```
SWITCH(Config)#interface vlan 1
SWITCH(Config-If-Vlan1)#ip bootp-client enable
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#
```

Related Command: **ip address, ip dhcp-client enable**

3.3.2.3 ip dhcp-client enable

Command: **ip dhcp-client enable**

no ip dhcp-client enable

Function: set switch to be DHCP Client. Obtain IP address and gateway address through DHCP negotiation; no command is to disable DHCP Client function and release IP address and gateway address obtained by DHCP

Default: disable DHCP Client function

Command mode: VLAN interface configuration mode

User guide: obtaining IP address through DHCP and through manual configuration or BootP are mutually exclusive. Opening two IP address obtaining methods at the same time are not allowed.

Example: obtain IP address through DHCP

```
SWITCH(Config)#interface vlan 1
SWITCH(Config-If-Vlan1)#ip dhcp-client enable
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#
```

Related: **ip address, ip bootp-client enable**

3.4 SNMP configuration

3.4.1 SNMP introduction

SNMP (Simple Network Management Protocol) is a standard protocol for internet management, which are widely used in computer network management. SNMP increasingly develop. SNMP v1[RFC1157] is the first version of SNMP. SNMPv1 is simple and easy to implement, so it receives wide acceptation. With the development of function and security performance, SNMP developedto version 2 SNMPv2 which are based on SNMPv1. So we will pay more emphasis on SNMPv1. In this paper, SNMP denotes SNMPv1 if it isn't specified,

SNMP protocol provides a direst method of exchanging management information between two points in a network. SNMP adopts polling as information query method, so it can be well supported by current computer network.

SNMP protocol adopts management station/ Agent mode, so SNMP contains two parts: NMS (network Management Station) , it operate SNMP-supported network management software client program station and it takes core effect; Agent is a server software which operate in the managed network devices and directly manage the managed objects. NMS use communication method to manage the managed objects through Agent.

SNMP's NMS and Agent adopt client/server mode to intercommunicate through standard messages. NMS send requests; Agent give response. SNMP has 5 types of messages

- Get-Request
- Get-Response
- Get-Next-Request
- Set-Request
- Trap

3.4.2 MIB introduction

A management information base (MIB) is a virtual database used for managing the entities in a communications network. The database is hierarchical (tree-structured) and entries are addressed

through object identifiers. SICOM6496 can work as SNMP agent, support SNMPv1/v2c, support basic MIB-II, RMON, common MIB and supports BRIDGE MIB, etc

3.4.3 RMON introduction

The Remote Network MONitoring (RMON) MIB was to support monitoring and protocol analysis of LANs.

The RMON MIB consists of ten groups. SICOM6496 support the most often used group 1, 2, 3 and 9

Statistics: real-time LAN statistics e.g. utilization, collisions, CRC errors

History: history of selected statistics

Alarm: definitions for RMON SNMP traps to be sent when statistics exceed defined thresholds

Event: send alerts (SNMP traps) for the Alarm group

Token Ring: extensions specific to Token Ring

3.4.4 SNMP Configuration

3.4.4.1 Task Sequence of SNMP configuration

1. enable or disable SNMP Agent server function
2. configure SNMP community string
3. configure secure IP address of SNMP management station
4. configure TRAP
5. enable or disable RMON

1. enable or disable SNMP Agent server function

Command	explanation
snmp-server enable **no snmp-server enable**	enable switch to be SNMP Agent server; no command is to disable SNMP agent server function

2. Configure SNMP community string

Command	explanation
snmp-server community {ro|rw} *<string>* **no snmp-server community *<string>***	Set switch community string; no command is to delete the community string configuration

3. Configure secure IP address of SNMP management station

Command	explanation
snmp-server securityip *<ip-address>* **no snmp-server securityip *<ip-address>***	Set a secure IP address of switch NMS which is allowed to access switch; no command is to delete the configured secure IP address

4. configure TRAP

command	explanation
snmp-server enable traps	device is allowed to send Trap message;

no snmp-server enable traps	no command is to forbid sending Trap message
snmp-server host *<host-addr>* *<community-string>* **no snmp-server host *<host-addr>***	Set the IP address and Trap community string of NMS which receives SNMP Trap message; no command is to delete the IP address of designated NMS which receives Trap message

5. enable or disable RMON

Command	explanation
rmon enable **no rmon enable**	Enable or disable RMON

3.4.4.2 SNMP Configuration Commands

3.4.4.2.1 rmon

Command: **rmon enable**

no rmon enable

Function: enable switch RMON function; no command is to disable RMON function

Command mode: global configuration mode

Default: disable RMON

Example:

enable RMON function

Switch(Config)#rmon enable

Disable RMON function

Switch(Config)#no rmon enable

3.4.4.2.2 snmp-server community

Command: **snmp-server community {ro|rw} *<string>***

no snmp-server community *<string>*

Function: set switch community string; no command is to delete the community string configuration

Command mode: global configuration mode

Parameter: ***<string>*** is a community string. **ro|rw** is to specify the method to access MIB, **ro** means read only; **rw** means read and write.

User guide: switch supports max 4 community strings.

Example:

Add read and write community string “private”

Switch(Config)#snmp-server community rw private

Add read only community string “public”

Switch(Config)#snmp-server community ro public

Change the community string “private” from read and write to read only

Switch(Config)#snmp-server community ro private

Delete community string “private”

Switch(Config)#no snmp-server community private

3.4.4.2.3 snmp-server enable

Command: **snmp-server enable**

no snmp-server enable

Function: enable SNMP agent server functions in switch; no command is to disable SNMP agent server function

Command mode: global configuration mode

Default: disable SNMP agent server function

User guide: if switch wants to manage configuration through network management software, pleae use this command to enable switch SNMP agent server function at first.

Example: enable switch SNMP agent server function

Switch(Config)#snmp-server enable

3.4.4.2.4 snmp-server enable traps

Command: **snmp-server enable traps**

no snmp-server enable traps

Function: allow device to send Trap message; no command is to forbid sending Trap message

Command mode: global configuration mode

Default: forbid sending Trap messages

User guide: when device is allowed to send Trap message, device will send Trap message to management station which can receive Trap message if device port is DOWN/UP or system is DOWN/UP.

Example:

Allow sending Trap message

Switch(Config)#snmp-server enable traps

Forbid sending Trap message is forbidden

Switch(Config)#no snmp-server enable trap

3.4.4.2.5 snmp-server host

Command: **snmp-server host *<host-addr>* *<community-string>***

no snmp-server host *<host-addr>*

Function: set the IP address and Trap community string of NMS which receives SNMP Trap message; no command is to delete the IP address of designated NMS which receive Trap message

Command mode: global configuration mode

Parameter: ***<host-addr>*** is the IP address of NMS which receives Trap messages. ***<community-string>*** is the community string used in sending Trap messages.

User guide: this command is to set the community string of sending Trap to the default value of RMON event community string. If RMON events don't set community string, use the community string set by this command when sending RMON Trap. If RMON events have set community string, send RMON Trap with RMON community string.

Example:

Set a IP address of receiving Trap

Switch(Config)#snmp-server host 1.1.1.5 dcstrap

Delete a IP address of receiving trap
Switch(Config)#no snmp-server host 1.1.1.5

3.4.4.2.6 snmp-server securityip

Command: **snmp-server securityip *<ip-address>***
no snmp-server securityip *<ip-address>*

Function: set a secure IP address of NMS which is allowed to access switch; no command is to delete secure IP address configuration

Command mode: global configuration mode

Parameter: ***<ip-address>*** is a secure IP address of NMS with dot-decimal format

User guide: only when the IP address of NMS accords is the same with the secure IP address set by this command, SNMP packets sent by NMS will be processed by switch.

Example:

Set the secure IP address of NMS

Switch(Config)#snmp-server securityip 1.1.1.5

Delete the secure IP address

Switch(Config)#no snmp-server securityip 1.1.1.5

3.4.5 SNMP Typical Configuration Example

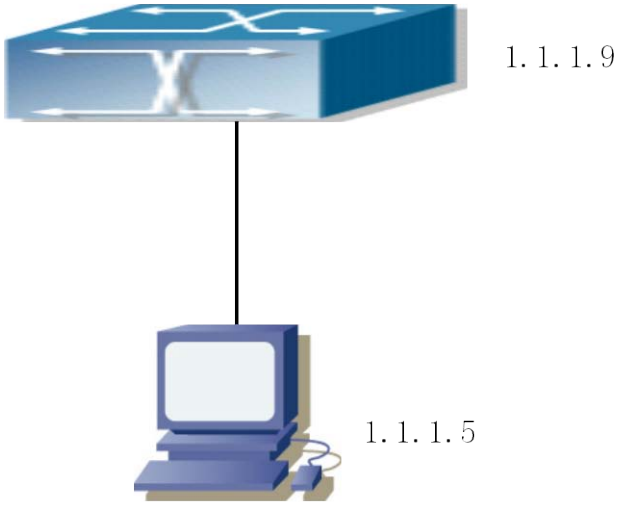


Figure 3-2: SNMP configuration example

IP address of NMS is 1.1.1.5; IP address of switch (Agent) is 1.1.1.9.

Example 1: network management software of NMS use SNMP protocol to obtain switch data.

The switch configuration is as follows:
Switch(Config)#snmp-server enable
Switch(Config)#snmp-server community rw private
Switch(Config)#snmp-server community ro public
Switch(Config)#snmp-server securityip 1.1.1.5

In this way, NMS can use private as community string to perform read and write access of switch, and also can use public as community string to make read only access of switch

Example 2: NMS receives switch Trap messages (note: NMS might has set authentication to Trap community string, so we suppose that Trap authentication community string of NMS is dcstrap).

The switch configuration is as follows:

Switch(Config)#snmp-server host 1.1.1.5 dcstrap

Switch(Config)#snmp-server enable traps

3.4.6 SNMP Troubleshooting Help

3.4.6.1 monitoring and debugging command

3.4.6.1.1 show snmp

Command: **show snmp**

Function: show all SNMP counter informations

Command mode: privilege user configuration mode

Example:

Switch#show snmp

0 SNMP packets input

0 Bad SNMP version errors

0 Unknown community name

0 Illegal operation for community name supplied

0 Encoding errors

0 Number of requested variables

0 Number of altered variables

0 Get-request PDUs

0 Get-next PDUs

0 Set-request PDUs

0 SNMP packets output

0 Too big errors (Max packet size 1500)

0 No such name errors

0 Bad values errors

0 General errors

0 Get-response PDUs

0 SNMP trap PDUs

content	explanation
snmp packets input	The total number of input SNMP packets
bad snmp version errors	The number of packets with error version information
unknown community name	The number of packets with error community name
illegal operation for community name supplied	the number of packets with illegal operation for community name
encoding errors	the number of SNMP packets with encoding errors
number of requested variablest	the number of variables which NMS

	requests
number of altered variables	the number of variables which NMS set
get-request PDUs	the number of packets receiving get requestes
get-next PDUs	the number of packets receiving getnext requestes
set-request PDUs	the number of packets receiving set requestes
snmp packets output	the number of output SNMP packets
too big errors	the number of SNMP packets with too_big errors
maximum packet size	the max size of SNMP packets
no such name errors	the number of packets sending request to nonexistent MIB
bad values errors	the number of SNMP packets with bad_values errors
general errors	the number of SNMP packets with general_values errors
response PDUs	number of sending response packets
trap PDUs	number of trap packets

3.4.6.1.2 show snmp status

Command: **show snmp status**

Function: show SNMP configuration information

Command mode: privilege user configuration mode

Example:

Switch#show snmp status↵

System Name :

System Contact :

System Location :

Trap enable

RMON enable

Community Information:

Trap manager Information:

Security IP Information:

content	description
System Name	system name
System Contact	system contact information
System Location	system location
Trap enable	enable or disable SNMP Trap function
RMON enable	enable or disable SNMP RMON
Community Information	the information of community string
Trap manager Information	the information of Trap host

Security IP Information	Security IP information

3.4.6.1.3 debug snmp packet

Command: **debug snmp packet**

no debug snmp packet

Function: turn on SNMP debugging switch; no command is to turn off debugging switch

Command mode: privilege user configuration

User guide: when user meets problems in using SNMP, user can turn on SNMP debugging switch to discover the cause

Example:

Switch#debug snmp packet

3.4.6.2 SNMP Troubleshooting Help

In SNMP configuration and application, incorrect physical connection, mis-configuration, etc problems might lead to SNMP abnormal working, so user should pay attention to the following points:

1. firstl, to ensure that all physical connections are right
2. second, to make sure that interaces and link protocols are UP (use **show interface** command), and enaure switch and host can communicate through Ping command (use **ping** command)
3. then, to confirm that SNMP Agent server function (use **snmp-server enable** command) is enabled
4. next, to ensure that security IP (use **snmp-server securityip** command) and community string (use **snmp-server community** command) are configured correctly for NMS, because if there is a little bit wrong, SNMP can't communicate with NMS
5. if user needs Trap function, Trap function must be enabled (use **snmp-server enable traps** command) at first to ensure that Trap can be sent to designated host. Please be noted to correctly set the IP and community string of Trap destination host (use **snmp-server host** command)
6. if RMON function is required, please enable RMON first. (use **rmon enable** command)
7. In SNMP operation process, if user still has questions, they can use **show snmp** command to chek the statistical information of SNMP receiveing and transmtting packets; use **show snmp status** command to view SNMP configuration information; use **debug snmp packet** command to turn on SNMP degugging switch and check debugging information.

3.5 Switch Update

SICOM6496 switch can be updated in two modes: TFTP update and FTP update in BootROM mode and in Shell mode

3.5.1 BootROM Mode

There are two update methods in BootROM mode: TFTP and FTP which can be selected by the command in BootROM mode.

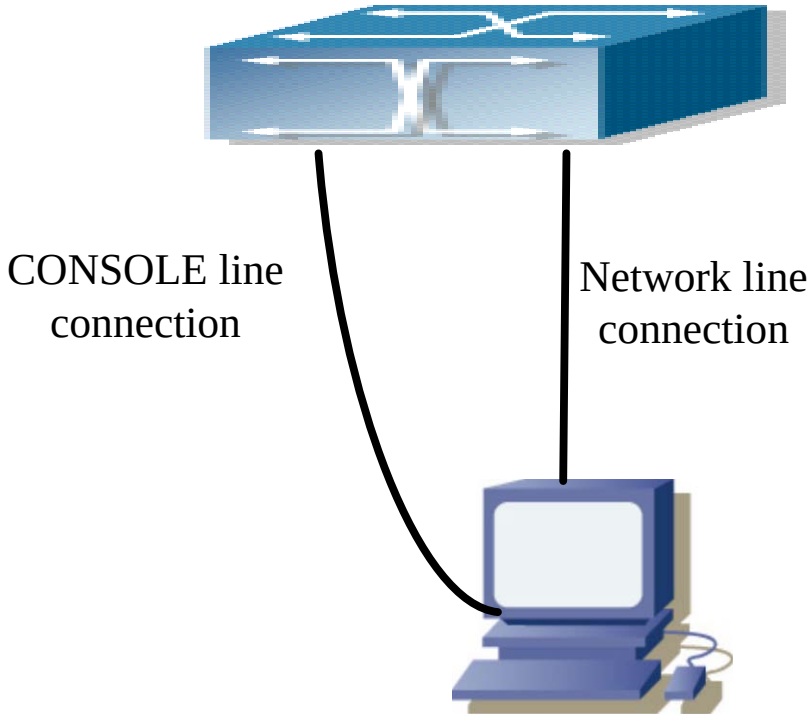


Figure 3-3 typical topology of switch update in BootROM mode

Update steps:

Step 1:

As shown in the figure, a PC serves as switch console. And connect a Ethernet port in console with Ethernet port in switch. FTP/TFTP server software is installed in the PC and img files for update is also in PC.

Step 2:

In switch startup process, press “ctrl+p” until switch enter BootROM monitoring mode. The displayed information is as follows:

KYLAND

Copyright (c) 2003 by KYLAND
All rights reserved.

Testing RAM...
67,108,864 RAM OK.

Loading BootROM...
Starting BootRom...

AT49BV160

CPU: PowerPC MPC8245MH266, Revision 12
Version: 1.1.4
Creation date: Jul 17 2003, 14:01:12

Attached TCP/IP interface to sc0.

[Boot]:
[Boot]:
[Boot]:

Step 3:
In BootROM mode, execute setconfig command, set the local IP address and mask, set the IP address and mask of server, select TFTP/FTP update method. If set the IP address of local machine to 192.168.1.2/24, the PC address is 192.168.1.66/24, select TFTP update method. The configuration is as follows:
[Boot]: config net
Host IP Address: 10.1.1.1 192.168.1.2
Server IP Address: 10.1.1.2 192.168.1.66
FTP(1) or TFTP(2): 1 2
Network interface configure OK.
[Boot]:

Step 4:
Open FTP/TFTP server in PC. If it is TFTP server, operate TFTP server program. If it is FTP server, operate FTP server program. Before downloading update version to switch, please check the connection state of server and switch. Use ping command at server, and ping succeed, operate load command in switch BootROM mode. If ping fails, please find out the reason. The configuration of updating system image files is as follows:
[Boot]: get nos.img
Loading...
entry = 0x10010
size = 0x1077f8

Step 5:
In BootROM mode, operate write nos.img command. Save updated system image files as follows:

[Boot]: write nos.img
Programming...

Program OK.
[Boot]:

Step 6:
After update successfully, operate run command in BootROM mode to return to CLI configuration interface.
[Boot]:run (or reboot)
Other commands in BOOTROM mode:
1. DIR command

To show files which saved in FLASH

[Boot]: dir

boot.rom 327,440 1900-01-01 00:00:00 --SH

boot.conf 83 1900-01-01 00:00:00 --SH

nos.img 2,431,631 1980-01-01 00:21:34 ----

startup-config 2,922 1980-01-01 00:09:14 ----

temp.img 2,431,631 1980-01-01 00:00:32 ----

2. CONFIG RUN command

To set IMG files operating in system startup and configuration files operating in configuration recovery.

[Boot]: config run

Boot File: [nos.img] nos1.img

Config File: [boot.conf]

3.5.2 FTP/TFTP update

3.5.2.1 FTP/TFTP introduction

FTP (File Transfer Protocol)/TFTP (Trivial File Transfer Protocol) both are file transferring protocols. They belong to application layer protocol, often used to transfer files between hosts, between host and switches. They both use client-server mode to transfer file. SICOM6496 supports FTP/TFTP client and server functions. When SICOM6496 works as FTP/TTP client, it can download configuration files or system files from remote FTP/TFTP server (host or switch) and upload current SICOM6496 configuration files or system files to remote FTP/TFTP server. When SICOM6496 serves as FTP/TFTP server, it can offer download and upload services to authorized FTP/TFTP client

3.5.2.2 FTP/TFTP Configuration

When SICOM6496 works as FTP client or TFTP client, their configuration are similar, we put them together to illustrate in this chapter.

3.5.2.2.1 Task sequence of FTP/TFTP configuration

1. FTP/TFTP Client Configuration
    1) upload/download configuration file or system file
    2) FTP client check file list on server
2. FTP server configuration
    1) enable FTP server
    2) configure FTP login name and password
    3) modify the idle timeout of FTP Server connection
    4)disable FTP server
3. TFTP server configuration
    1) enable TFTP server
    2)configure the idle timeout of TFTP server connection
    3)configure retransmitting times if no receiving response messages in the timeout
    4)disable TFTP Server

1. FTP/TFTP client configuration

1) Upload/download files to/from FTP/TFTP client

command	explanation
Privilege user configuration mode	

copy <***source-url***> <***destination-url***> **[ascii | binary]**	Updload/download files to/from FTP/TFTP client

2) FTP client check file list on server t

Global configuration configuration	
dir <***ftpServerUrl***>	FTP client Check file list on server; FtpServerUrl is the format of ftp://user:password@IP Address

2. FTP server configuration

1) Enable FTP server

Command	explanation
Global configuration mode	
ftp-server enable **no ftp-server enable**	Enable FTP server; no command is to disable FTP server and forbid FTP user login

2) Configure FTP login name and password

Command	explanation
Global configuration mode	
ip ftp username <***username***> **no ip ftp username** <***username***>	Configure FTP login name; no command is to delete the configuration of user name and password
ip ftp password [type{0|7}] <***password***>	Configure FTP login password

3) Modify the idle timeout of FTP server connection

Command	explanation
Global configuration mode	
ftp-server timeout <***seconds***> **no ftp-server timeout**	Set the connection timeout; no command is to restore default configuration

3. TFTP server configuration

1) Enable TFTP server

Command	explanation
Global configuration mode	
tftp-server enable **no tftp-server enable**	Enable TFTP server; no command is to disable TFTP server and forbid TFTP user login.

2) Modify the idle timeout of TFTP server connection

command	explanation
Global configuration mode	
tftp-server transmission-timeout <***seconds***>	Set timeout

3) Modify the retransmitting times of TFTP server connection

command	explanation
Global configuration mode	

tftp-server retransmission-number < ***number*** **>**	Set the max number of retransmitting times in timeout

3.5.2.2.2 FTP/TFTP configuration command

- **copy (FTP)**

Command: **copy** <***source-url***> <***destination-url***> **[ascii | binary]**

Function: upload/download files to/from FTP client

Parameter: <***source-url***> is the souce address of the file or catalogue; <***destination-url***> is the destination address of files or catalogue. <***source-url***> and <***destination-url***> change according to the address of files and catalogue; **ascii** means that files are transmitted with ASCII standard; **binary** means that files are transmitted with a binary standard (default transmission). When URL is FTP address, its format is ftp://<*username*>:<*password*>@<*ipaddress*>/<*filename*>, <*username*> is FTP username, <*password*> is FTP user password, <*ipaddress*> is IP address of FTP server/client, <*filename*> is the name of uploaded and downloaded file.

Special keywords in filename

keyword	Source address or destination address
running-config	Operate configuration files
startup-config	Start up configuration files
nos.img	System files
nos.rom	System startup files

Command mode: privilege user configuration mode

User guide: this command supports command line prompts. If user can input a command **copy** ***<filename>*** **ftp://** or **copy ftp://** ***<filename>,*** then press "Enter" directly, system will display the ftp server ip address [x.x.x.x] >

ftp username>

ftp password>

ftp filename>

It require to input FTP server address, username, password and filename.

Example:

1. save images in Flash to FTP server 10.1.1.1. the login name of FTP server is Switch, and password is KYLAND:

   SWITCH#copy nos.img ftp://Switch:KYLAND@10.1.1.1/nos.img

2. get system file nos.img from FTP server 10.1.1.1, username: Switch, password: KYLAND

   SWITCH#copy ftp://Switch:KYLAND@10.1.1.1/nos.img nos.img

3. save operation configuration files

   SWITCH#copy running-config startup-config

Related Command: **write**

dir

Command: **dir** ***<ftp-server-url>***

Function: check the file list on FTP server

Parameter: the format of **<** ***ftp-server-url*** **>** is ftp://<*username*>:<*password*>@<*ipaddress*>,

<*username*> is FTP username, <*password*> is FTP password, <*ipaddress*> is the IP address of FTP server.

Command mode: global configuration mode

Example: check the file list of FTP server 10.1.1.1, username and password both are KYLAND.
SWITCH#config
SWITCH(Config)#dir ftp:// KYLAND:KYLAND@10.1.1.1

- **ftp-server enable**

Command: **ftp-server enable**
no ftp-server enable

Function: enable FTP server; no command is to disable FTP server and forbid FTP user login.

Default: disable FTP server

Command mode: global configuration mode

User guide: after enable FTP server, switch still has FTP client function. By default, disable FTP server.

Example: enable FTP server function
SWITCH#config
SWITCH(Config)# ftp-server enable
Related Command: **ip ftp password, ip ftp username**

- **ftp-server timeout**

Command: **ftp-server timeout <*seconds*>**
no ftp-server timeout

Function: set the idle timeout of data connection; no command is to restore default configuration

Parameter: **<*seconds*>** is the idle timeout of FTP connection with the unit of second and in a range of 5~4294967295

Default: 600s

Command mode: global configuration mode

User guide: when the timeout exceed this range, FTP control is disconnected.

Example: change the timeout to 100s
SWITCH#config
SWITCH(Config)#ftp-server timeout 100

- **ip ftp password**

Command: **ip ftp password {0|7} <*password*>**

Function: configure FTP login password

Parameter: **0|7** respectively indicates unencrypted password and encrypted password, **<*password*>** is a password for FTP connection with max 100 characters

Default: password is username@Switchname.domain, username is current username, Switchname is the name of switvh, domain is switch domain name.

Command mode: global configuration mode

Related Command: **ip ftp username**

- **ip ftp username**

Command: **ip ftp username <*username*>**

no ip ftp username <*username*>

Function: configure FTP login name; no command is to delete username and password configuration

Parameter: ***<username>*** is username for FTP connection with max 100 characters

Default: anonymous FTP connection

Command mode: global configuration mode

Example: configure username to KYLAND and password to KYLAND
SWITCH#config
SWITCH(Config)#ip ftp username KYLAND
SWITCH(Config)#ip ftp password 0 KYLAND

Related Command: **ip ftp password**

- **copy (TFTP)**

Command: **copy** <***source-url> <destination-url>*** **[ascii | binary]**

Function: upload/download files to/from TFTP client

Parameter: <***source-url>*** is the source address of files or catalogue; ***<destination-url>*** is the destination address of files or catalogue. <***source-url>*** and ***<destination-url>*** change according to the address of files and catalogue. **ascii** means files are transmitted with ASCII standard. **binary** means files are transmitted with a binary standard (default transmission). When URL is TFTP address, its format ***is*** tftp://<*ipaddress*>/<*filename*>, <*ipaddress*> is IP address of TFTP server/client, <*filename*> is the name of uploaded or downloaded file.

Special keywords of filename

keyword	Source address or destination address
running-config	Operate configuration file
startup-config	Start up configuration files
nos.img	System files
nos.rom	System startup files

Command mode: privilege user configuration mode

User guide: this command supports command line prompts. If user input a command **copy** ***<filename>*** **tftp://** or **copy tftp:// *<filename>,*** then press "Enter" directly, system will display the prompts as follows:
tftp server ip address>
tftp filename>
It require to input TFTP server address, username.

Example:

1. save images in FLASH to TFTP server 10.1.1.1.
   SWITCH#copy nos.img tftp:// 10.1.1.1/ nos.img
2. get system file nos.img from TFTP server 10.1.1.1
   SWITCH#copy tftp://10.1.1.1/nos.img nos.img
3. save operation configuration files
   SWITCH#copy running-config startup-config

Related Command: **write**

- **tftp-server enable**

Command: **tftp-server enable**

no tftp-server enable

Function: enable TFTP server; no command is to disable TFTP server and forbid TFTP user login.

Default: disable TFTP server

Command mode: global configuration mode

User guide: after enable TFTP server, switch still has TFTP client function. By default, disable TFTP server.

Example: enable TFTP server function
SWITCH#config
SWITCH(Config)#tftp-server enable

Related Command: **tftp-server timeout**

- **tftp-server retransmission-number**

Command: **tftp-server retransmission-number <*number*>**

Function: set the number of TFTP server retransmission times

Parameter: **<*number*>** is the number of retransmission times in a range of 1~20

Default: 5 times

Command mode: global configuration mode

Example: change the number of retransmission times to 10
SWITCH#config
SWITCH(Config)#tftp-server retransmission-number 10

- **tftp-server transmission-timeout**

Command: **tftp-server transmission-timeout <*seconds*>**

Function: set the transmission timeout of tftp server

Parameter: **<*seconds*>** is timeout in a range of 5~3600s

Default: 600s

Command mode: global configuration mode

Example: change the timeout to 60s
SWITCH#config
SWITCH(Config)#tftp-server transmission-timeout 60

3.5.2.3 FTP/TFTP configuration example

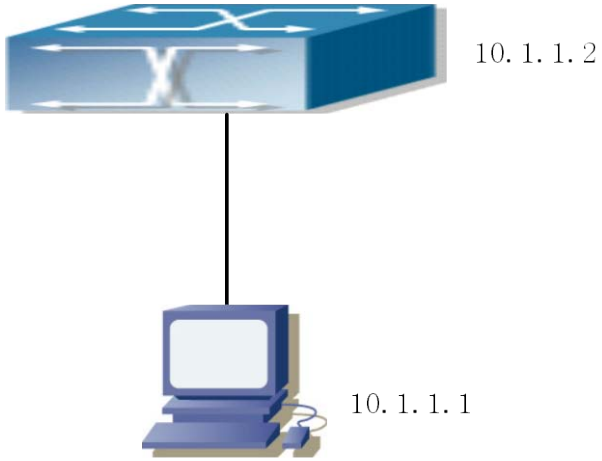


Figure 3-4: download nos.img files as FTP/TFTP client

Example 1: switch serve as FTP/TFTP client. It use a port to connect with computer which works as FTP/TFTP server with IP address of 10.1.1.1. Switch works as FTP/TFTP server to manage VLAN with IP address of 10.1.1.2. Download switch's nos.img files to computer

- FTP configuration

Computer configuration:

Start up FTP Server software in computer, and set username to Switch" and password "KYLAND". Put the file "12_30_nos.img" in the FTP server catalogue of computer

The steps of switch configuration:

```
SWITCH(Config)#inter vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.1.2 255.255.255.0
SWITCH(Config-If-Vlan1)#no shut
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#exit
SWITCH#copy ftp://Switch:KYLAND@10.1.1.1/12_30_nos.img nos.img
SWITCH#reload
```

After finishing above command operations, switch can download file"nos.img" in computer to switch FLASH.

- TFTP configuration

Computer configuration:

Start up TFTP server software in computer, and put the file "nos.img" in computer TFTP server catalogue

Switch configuration steps are as follows:

```
SWITCH(Config)#inter vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.1.2 255.255.255.0
SWITCH(Config-If-Vlan1)#no shut
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#exit
SWITCH#copy tftp://10.1.1.1/12_30_nos.img nos.img
SWITCH#reload
```

Example 2: switch serves as FTP server. Use a port in switch to connect with computer. Switch work as FTP server and computer is FTP client. Transmit file "nos.img" from switch to computer and save it with the name 12_25_nos.img.

Switch configuration steps:

```
SWITCH(Config)#inter vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.1.2 255.255.255.0
SWITCH(Config-If-Vlan1)#no shut
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#ftp-server enable
SWITCH(Config)#ip ftp username Switch
SWITCH(Config)#ip ftp password 0 KYLAND
```

Computer configuration:

Login to switch through FTP client software with username “Switch” and password “KYLAND”. Download file “nos.img” from switch to computer by the command “get nos.img 12_30_nos.img”.

Example 3:switch serves as TFTP server. User a port in switch to connect with computer. Switch work as TFTP server and computer is TFTP client. Transmit file ”nos.img” from switch to computer.

Switch configuration steps:

```
SWITCH(Config)#inter vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.1.2 255.255.255.0
SWITCH(Config-If-Vlan1)#no shut
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#tftp-server enable
```

Computer configuration:

Login to switch through TFTP client software. Download file “nos.img” from switch to computer by the command “tftp”.

Example 4: switch serve as FTP/TFTP client. Use a port in switch to connect with computer. Computer work as FTP/TFTP server with IP address of 10.1.1.1 which records multiple users configuration files. Switch is FTP/TFTP client. Switch manage VLAN with IP address 10.1.1.2. Download user configuration files from computer to switch and save it in switch FLASH.

- FTP configuration

Computer configuration:

Start up FTP Server software in computer, and set username to Switch” and password to “KYLAND”. Put the file “Profile1”,”Profile2”, “Profile3” in the FTP server catalogue of computer

The steps of switch configuration:

```
SWITCH(Config)#inter vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.1.2 255.255.255.0
SWITCH(Config-If-Vlan1)#no shut
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#exit
SWITCH#copy ftp://Switch:KYLAND@10.1.1.1/Profile1 Profile1
SWITCH#copy ftp://Switch:KYLAND@10.1.1.1/Profile2 Profile2
SWITCH#copy ftp://Switch:KYLAND@10.1.1.1/Profile3 Profile3
```

After finishing above command operation, switch can download user configuration files from computer to its FLASH.

- TFTP configuration

Computer configuration:

Start up TFTP server software in computer, and put the file “Profile1”, “Profile2”, “Profile3” in computer TFTP server catalogue

```
SWITCH(Config)#inter vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.1.2 255.255.255.0
```

SWITCH(Config-If-Vlan1)#no shut
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#exit
SWITCH#copy tftp://10.1.1.1/ Profile1 Profile1
SWITCH#copy tftp://10.1.1.1/ Profile2 Profile2
SWITCH#copy tftp://10.1.1.1/ Profile3 Profile3

Example 5: SICOM6496 serves as FTP client to check file list in FTP server

Use an Ethernet port in switch to connect PC. PC work as FTP server with IP address 10.1.1.1. switch work as FTP client. IP address of switch VLAN1 interface is 10.1.1.2.

- FTP configuration

PC:

Start up FTP server software in PC, set the username “Switch” and password “KYLAND”.
SICOM6496:
SWITCH(Config)#inter vlan 1
SWITCH(Config-If-Vlan1)#ip address 10.1.1.2 255.255.255.0
SWITCH(Config-If-Vlan1)#no shut
SWITCH(Config-If-Vlan1)#exit
SWITCH(Config)#dir ftp://Switch:KYLAND@10.1.1.1
220 Serv-U FTP-Server v2.5 build 6 for WinSock ready...
331 User name okay, need password.
230 User logged in, proceed.
200 PORT Command successful.
150 Opening ASCII mode data connection for /bin/ls.
recv total = 480
nos.img
nos.rom
parsecommandline.cpp
position.doc
qmdict.zip
shell 维护统计.xls
…(省略部分显示)
show.txt
snmp.TXT
226 Transfer complete.
SWITCH(Config)#

3.5.2.4 FTP/TFTP troubleshooting help

3.5.2.4.1 monitoring and debugging command

3.5.2.4.1.1 show ftp

Command: **show ftp**

Function: show the setting situation of FTP server parameter

Command mode: no to show

Example:
SWITCH#sh ftp
Timeout :600

content	description
Timeout	timeout

3.5.2.4.1.2 show tftp

Command: **show tftp**

Function: show the setting situation of TFTP server parameters

Default: no to show

Command mode: privilege user configuration mode

Example:
SWITCH#sh tftp
timeout :60
Retry Times :10

content	explanantion
Timeout	timeout
Retry Times	A number of retransmission times

3.5.2.4.2 FTP troubleshooting help

When upload/download system files by using FTP protocol, please ensure all links are available. It means before using FTP, use ping command to check if the links from FTP client to server is available. If ping fails, please find out the reason and make them well connected

1. Below are the correct information when sending packets. When error occurs in the information, please check if links are available and re-operate copy command.
   220 Serv-U FTP-Server v2.5 build 6 for WinSock ready...
   331 User name okay, need password.
   230 User logged in, proceed.
   200 PORT Command successful.
   nos.img file length = 1526021
   read file ok
   send file
   150 Opening ASCII mode data connection for nos.img.
   226 Transfer complete.
   close ftp client.
2. Below is the correct information when receiving packets. If error occurs, please check if links are available and re-operate copy command.
   220 Serv-U FTP-Server v2.5 build 6 for WinSock ready...
   331 User name okay, need password.
   230 User logged in, proceed.
   200 PORT Command successful.
   recv total = 1526037
   ****

write ok

150 Opening ASCII mode data connection for nos.img (1526037 bytes).

226 Transfer complete.

3. If user use FTP to update system files or system startup files, please wait until system display the prompts of successful update “close ftp client.” or”226 Transfer complete”, now the switch can be restarted. Otherwise, switch can not be restarted. If system files and system startup files are updated unsuccessfully, please update again or enter BootROM mode to update.

3.5.2.4.3 TFTP troubleshooting help

When use TFTP protocol to upload or download system files, please ensure all links are available that means use Ping command to check if the links from TFTP client to server are available. If Ping fails,, please find out the reason and make them available.

1. Below are the correct information when sending packets. When error occurs in the information, please check if links are available and re-operate copy command.

   nos.img file length = 1526021

   read file ok

   begin to send file,wait...

   file transfers complete.

   close tftp client.

2. Below is the correct information when receiving packets. If error occurs, please check if links are available and re-operate copy command.

   begin to receive file,wait...

   recv 1526037

   ****

   write ok

   transfer complete

   close tftp client.

If user use TFTP to update system files or system startup files, please wait until system display the prompts of successful update “close tftp client.” now the switch can be restarted. Otherwise, switch can not be restarted. If system files and system startup files are updated unsuccessfully, please update again or enter BootROM mode to update.

3.6 LLDP configuration

3.6.1 LLDP protocol introduction

LLDP (Link Layer Discovery Protocol) is a new protocol defined in 802.1ab. it can make its neighboring device send its status information to other devices and each port in all devices store the information defined itself. If is required, they can send their updated information to its directly-connected devices which will store the new information in standard SNMP MIBs. Netowork

management system is able to inquire the connection situation of layer 2 from MIB. LLDP is unable to configure or control network elements and flow, and it is only report configuration as layer 2.

Kyland devices require to specify chassis ID on LLDP configuration, so as to EMS system and other network management software can identify the devices. Meanwhile, our devices support LLDP management address domain which is used to inform IP addresses to MIB nodes when multi IP address exist in switch. It offer convenience to related network management software.

3.6.2 LLDP configuration

3.6.2.1 Task sequence of LLDP configuration

1. Enable or disable LLDP function
2. Configure LLDP chassis ID
3. Enable or disable LLDP address management function (optional)

1. Enable or disable LLDP function

Command	explanation
lldp **no lldp**	Enable switch LLDP function; no command is to disable LLDP function

2. Configure LLDP chassis ID

Command	explanation
lldp chassis-id ***<ip-address>*** **no lldp chassis-id**	Set LLDP chassis ID; no command is to delete LLDP chassis ID.

3. Enable or disable LLDP address management function (optional)

Command	explanation
lldp tlv management-address **no lldp tlv management-address**	Enable LLDP address management function; no command is to delete LLDP address management function

3.6.2.2 LLDP configuration commands

3.6.2.2.1 lldp

Command: **lldp**

no lldp

Function: enable switch LLDP function; no command is to disable LLDP function

Command mode: global configuration mode

Default: disable LLDP

Example:

enable LLDP function

Switch(Config)#lldp

Disable LLDP function

Switch(Config)#no lldp

3.6.2.2.2 lldp chassis-id

Command: **lldp chassis-id** ***<ip-address>***

no lldp chassis-id

Function: set LLDP chassis ID; no command is to delete LLDP chassis ID

Command mode: global configuration mode

Parameter: global configuration mode

Parameter: ***<ip-address>*** is a IP address of a interface which can be accessed by device network management software

Example:

Configure LLDP chassis ID:
Switch(Config)#lldp chassis-id 192.168.1.1

Delete LLDP chassis ID:

Switch(Config)#no lldp chassis-id

3.6.2.2.3 lldp tlv management-address

Command: **lldp tlv management-address**

no lldp tlv management-address

Function: enable LLDP address management function; no command is to delete LLDP address management function

Command mode: global configuration mode

Default: disable LLDP address management function

Example:
enable LLDP address management function:
Switch(Config)#lldp tlv management-address
Disable LLDP address management function:
Switch(Config)#no lldp tlv management-address

3.6.3 LLDP configuration example

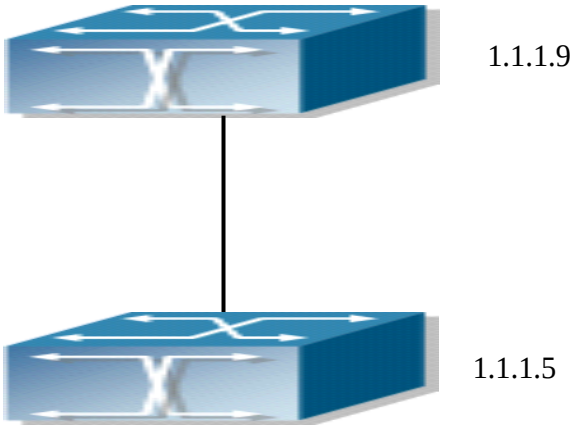


Figure 3-5: LLDP configuration example

Two switch are directly connected. The IP address of top switch is 1.1.1.9; the IP address of bottom switch is 1.1.1.5

Step 1: enable LLDP in top switch

Switch configuration:
Switch(Config)#lldp
Switch(Config)#lldp chassis-id 1.1.1.9

Step 2: enable LLDP in bottom switch

Switch configuration:
Switch(Config)#lldp
Switch(Config)#lldp chassis-id 1.1.1.5

In this way, two switch become neighbor that means it save link information of the device in other end.

3.6.4 LLDP troubleshooting help

3.6.4.1 monitoring and debugging command

3.6.4.1.1 show lldp

Function: show lldp neighbor information

Command mode: privilege user configuration mode

Example:
Switch#show lldp

Local port: Ethernet1/4
Remote port: 14
Neighbor Chassis ID: 192.168.86.180

Local port: Ethernet2/2
Remote port: 1/2
Neighbor Chassis ID: 1.1.1.9

content	explanation
Local port	The port in local device, which is connected with the other end device
Remote port	The port in the other end device, which is connected with local device
Neighbor Chassis ID	The identifier of the other end device

3.6.4.1.2 debug lldp error

Command: **debug lldp error**
no debug lldp error

Function: turn on LLDP debugging switch; no command is to turn off this debugging switch

Command mode: privilege user configuration mode

User guide: when user meets problems in using LLDP, please turn on LLDP debugging switch and find out the reason

Example: Switch# debug lldp error

3.6.4.1.3 debug lldp tx

Command: **debug lldp tx**
no debug lldp tx

Function: turn on LLDP error debugging switch for packet tranmission; no command is to turn off this debugging switch

User guide: when user meets problem in using LLDP, please turn on LLDP debugging switch to find out the reason.

Example: Switch# debug lldp tx

3.6.4.1.4 debug lldp rx

Command: **debug lldp rx**

no debug lldp rx

Function: turn on LLDP debugging switch for packet receiving; no command is to turn off this debugging switch

Command mode: privilege user configuration mode

User guide: when user meets problem in using LLDP, please turn on LLDP debugging switch to find out the reason.

Example: Switch# debug lldp rx

3.6.4.1.5 debug lldp all

Command: **debug lldp all**

no debug lldp all

Function: turn on all LLDP debugging switches; no command is to turn off all LLDP debugging switchwes

Command mode: privilege user configuration mode

User guide: when user meets problems in using LLDP, turn on LLDP debugging switch to find out the reason

Example: Switch# debug lldp all

3.6.4.2 LLDP Troubleshooting Help

In LLDP configuration and application, incorrect physical connection, mis-configuration, etc problems might lead to LLDP abnormal working, so user should pay attention to the following points:

- Ensure correct physical connection
- Configure LLDP chassis id correctly to ensure no collision in chassis-id configuration between devices and network management software can ping this IP address successfully.

3.7 WEB Management

Click Device Basic Configuration to expand the submenu of basic configuration list which can make basic configuration to switch including the commands of entering or exiting from privilege user mode, commands of entering and exiting from interface configuration mode, setting or showing switch clock, showing switch system version, etc

3.7.1 Switch Basic Configuration

Click Device Basic Configuration→Switch Basic Configuration to open the submenu of switch basic configuration to set switch clock, switch CLI prompt (hostname), host-to-IP address mapping, etc.

☞ Clock configuration-setting system date and time which is equivalent to CLI command in chapter 3.1.1

Set HH:MM:SS to 23:0:0 and YY:MM:DD to 2002.8.1, click “Apply” to finish switch time configuration

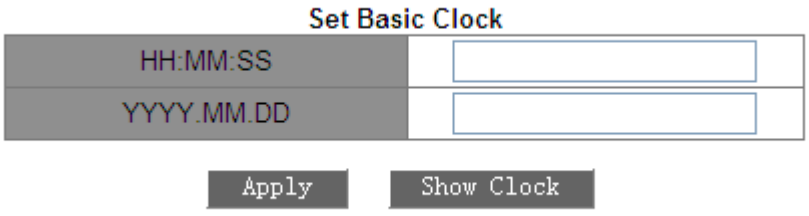


Figure 3-6: Clock Configuration

☞ Basic configuration- setting switch CLI prompt (hostname) which is equivalent to CLI command

in chapter 3.1.9

Set host name to Test, click "Apply" to complete configuration

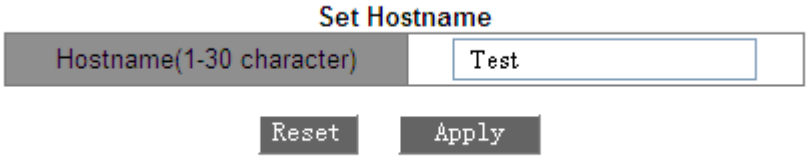


Figure 3-7 hostname configuration

☞ Basic configuration-setting mapping hostname and IP address which is equivalent to CLI command in chapter 3.1.8

Set the host name to London and IP address to 200.121.1.1, click "Add" to complete configuration

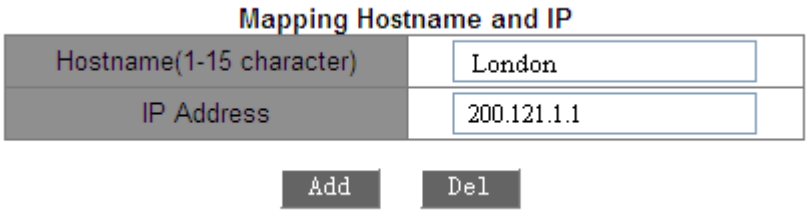


Figure 3-8: setting mapping relation of host and IP address

☞ Set Exec Timeout- setting the timeout of exiting from privilege user configuration mode which is equivalent to CLI command in chapter 3.1.5

Setting the timeout to 6, click "Apply",

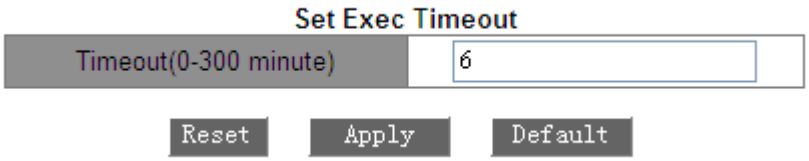


Figure 3-9: set exec timeout

3.7.2 SNMP Configuration

Click Device Advanced Configuration→SNMP configuration to expand the submenu of switch SNMP configuration.

3.7.2.1 Enable SNMP Agent server function

Click Device Advanced Configuration→SNMP configuration→Enable SNMP Agent to enable SNMP agent server function

☞ Enable SNMP Agent; enable or disable the function of switch serving as SNMP agent server, which is equivalent to CLI command in chapter 3.4.4.2.3

Select "Open", click "Apply" to complete configuration

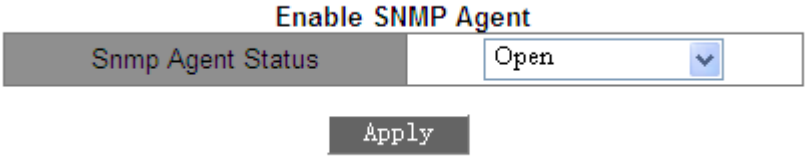


Figure 3-10 Enable SNMP Agent

3.7.2.2 SNMP Manager Configuration

Click Device Advanced Configuration→SNMP configuration→SNMP Manager Configuration to set switch community string, which is equivalent to CLI command in chapter 3.4.4.2.2

- Community string
- Access priority-specify the mode of MIB access, read only or read and write
- Status: valid or invalid

Setting the community string to Public: select "read only" in access priority, select "valid" in status; click "Apply" to finish configuration

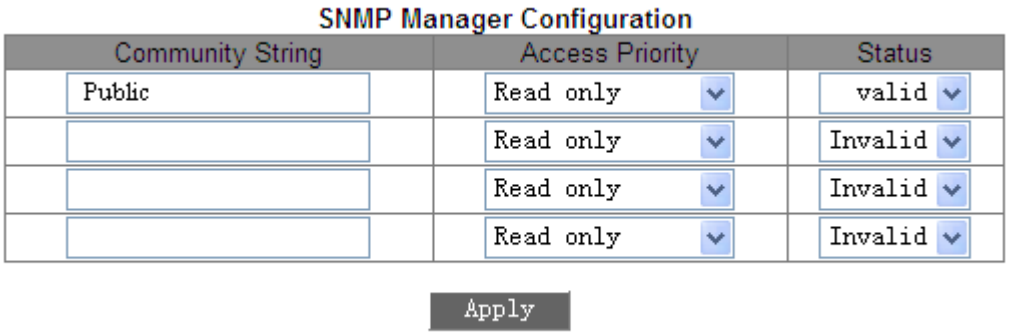


Figure 3-11 SNMP manager configuration

3.7.2.3 TRAP Manager Configuration

Click Device Advanced Configuration→SNMP configuration→TRAP Manager Configuration to set the the IP address of NMS which is SNMP Trap receiver and Trap community string, which is equivalent to CLI command in chapter 3.4.4.2.5

- Trap receiver (0.0.0.0)-the IP address of NMS which is Trap receiver
- Community string-used in sending Trap message
- Status configuration: valid or invalid

Setting Trap receiver to 41.1.1.10, set "kervin" in community string, and valid in status, click "Apply" to complete configuration.

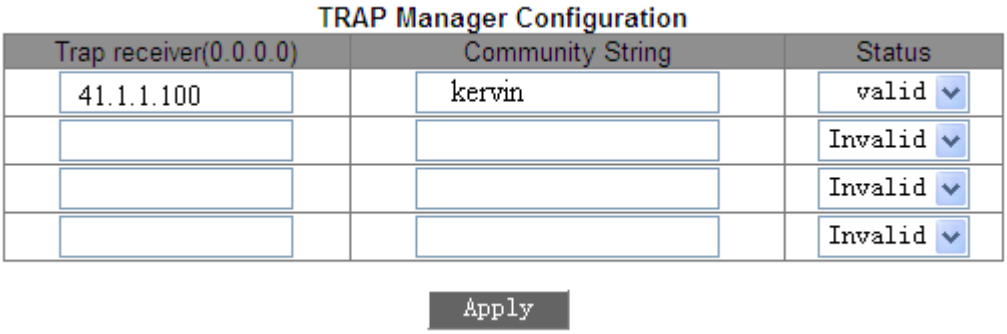


Figure 3-12 Trap manager configuration

3.7.2.4 Set IP address of SNMP Manager

Click Device Advanced Configuration→SNMP configuration→Set IP address of SNMP Manager to set the IP address of SNMP Trap receiver and Trap community string, which is equivalent to CLI command in chapter 3.4.4.2.6

- ☞ Security IP address (0.0.0.0)-NMS security IP address
- ☞ Status: valid and invalid

setting security IP address to 41.1.1.100, select valid in status, click "Apply" to finish configuration

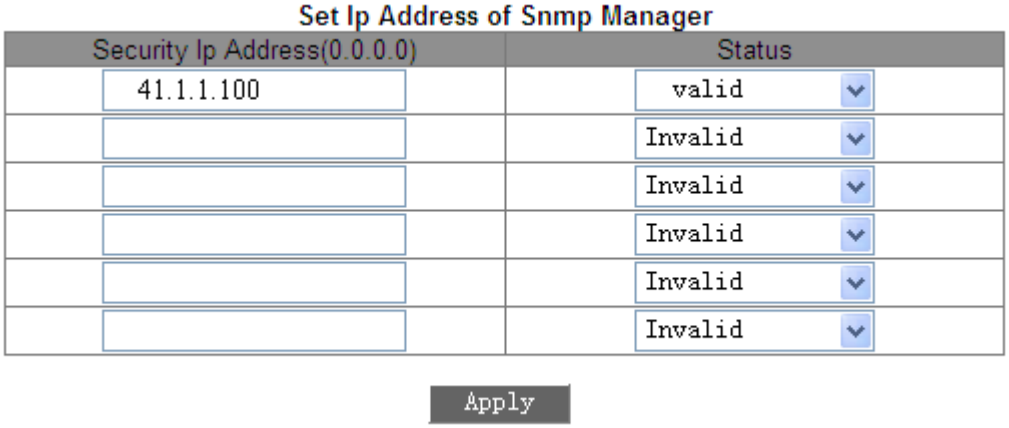


Figure 3-13 SNMP manager IP address configuration

3.7.2.5 SNMP Statistics

Click Device Advanced Configuration→SNMP configuration→SNMP Statistics to show all SNMP counter informations, which is equivalent to CLI command in chapter 3.4.6.1.1

SNMP Statistics	Number
Incoming Snmp Packet	29
Version Error Snmp Packet	0
Received Snmp GetNext Packet	24
Received SET Request Packet	0
Outgoing Snmp Packet	26
Too_big Error Snmp Packet	0
Max-Length of Snmp Datagram	1500
Snmp Request for Inexistent MIB Object	0
Bad_value Error Snmp Packet	0
General_error Snmp Packet	0
Transmitting Response Packet	24
Transmitting TRAP Packet	2
Nms SET Request Packet	0
Communitry String Error Snmp Packet	0
Communitry String Priority Error	0
Coding Error Snmp Packet	0

Show

Figure 3-14: SNMP statistics

3.7.2.6 RMON and TRAP configuration

Click Device Advanced Configuration→SNMP configuration→RMON and TRAP Configuration to set switch RMON function

- RMON status-enable or disable switch RMON function which is equivalent to CLI command in chapter 3.4.4.2.1
- Trap status—allow device to send Trap message which is equivalent to CLI command in chapter3.4.4.2.4

Select Open in RMON status, select "Open" in Trap status, click "Apply" to complete this configuration

RMON And TRAP Configuration

RMON Status	Open
Trap Status	Open

Apply

Figure 3-15 RMON and TRAP configuration

3.7.3 Switch Update

Click Device Basic Configuration→Switch Update to open the submenu of switch update which contains following parts:

TFTP update, include

TFTP client service-TFTP client configuration

TFTP server service-TFTP server configuration

FTP update, include

FTP client service-FTP client configuration

FTP server service-FTP server configuration

3.7.3.1 TFTP Client Configuration

Click Device Basic Configuration→Switch Update→TFTP Service→TFTP Client Service to enter configuration page, which is equivalent to CLI command in chapter3.5.2.2.9

Transmission type-"ascii" means packet transmission with ASCII standard, "binary" means packet transmission with binary standard.

If user want to get system file "nosD.img" from TFTP server "192.168.134.134". please input as follows, click "download"

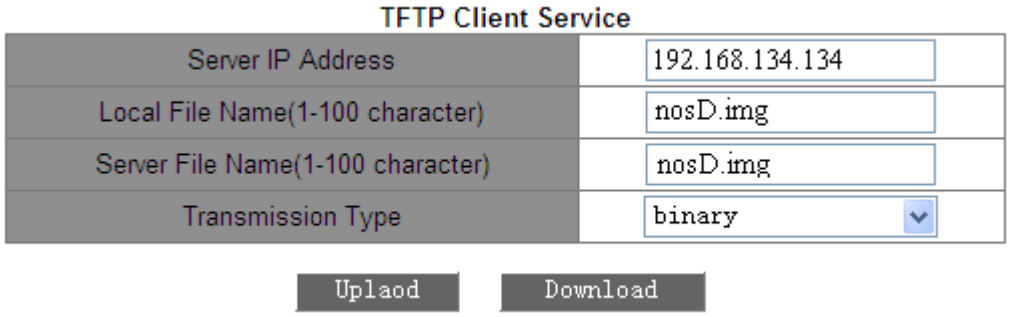


Figure 3-16 TFTP client configuration

3.7.3.2 TFTP Server Configuration

Click Device Basic Configuration→Switch Update→TFTP Service→TFTP Server Service to enter configuration page, which is equivalent to CLI command in chapter3.2.2.2.2

Explanations:

Server Status-- open or close, which is equivalent to CLI command in chapter 5.5.2.2.10

TFTP Timeout-- It is equivalent to CLI command in chapter 5.5.2.2.12

TFTP Retransmit Times--. It is equivalent to CLI command in chapter 5.5.2.2.11.

To enable TFTP server, please select "open" in server status, click "Apply".

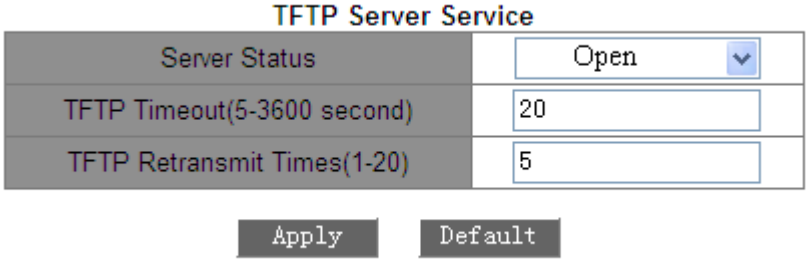


Figure 3-17 TFTP server configuration

3.7.3.3 FTP Client Configuration

Click Device Basic Configuration→Switch Update→FTP Service→FTP Client Service to enter configuration page, which is equivalent to CLI command in chapter3.5.2.2.3

Transmission type--"ascii" means packet transmission with ASCII standard, "binary" means packet transmission with binary standard.

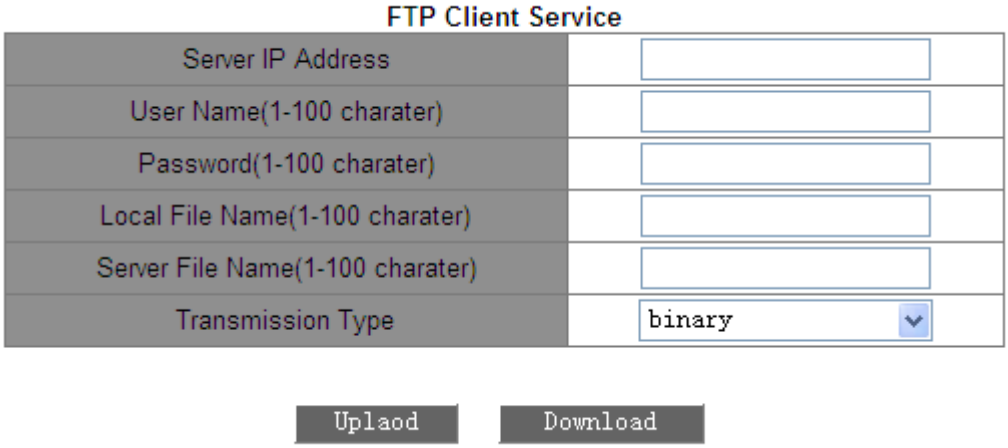


Figure 3-18 FTP client configuration

3.7.3.4 FTP Server Configuration

Click Device Basic Configuration→Switch Update→FTP Service→FTP Server Service to enter configuration page

Explanations:

FTP server status-- open or close, which is equivalent to CLI command in chapter 3.5.2.2.5

FTP timeout-- It is equivalent to CLI command in chapter 3.5.2.2.6

User name—it is equivalent to CLI command 3.5.2.2.8

Password—it is equivalent to CLI command 3.5.2.2.7

Status-- showing password state, plain text or encryption, which is equivalent to CLI command 3.5.2.2.7

Delete—it is equivalent to CLI command 3.5.2.2.8

Add—it is equivalent to CLI command 3.5.2.2.8

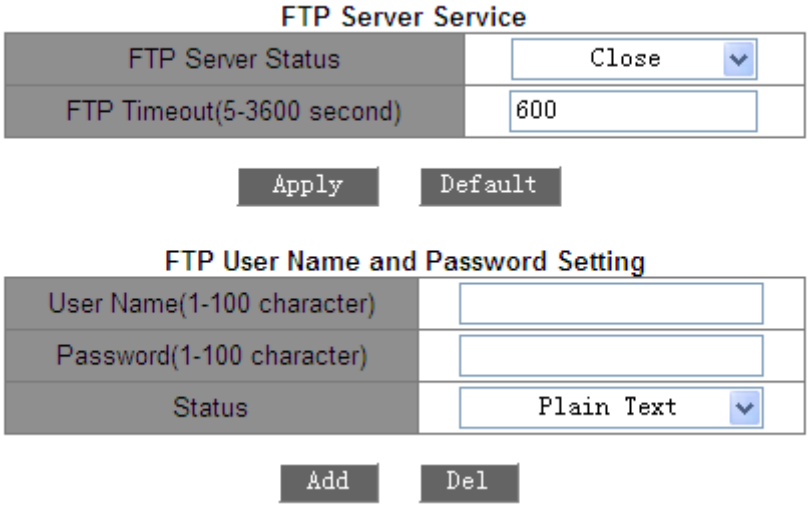


Figure 3-17 FTP server configuration

3.7.4 Maintenance and Debugging Commands

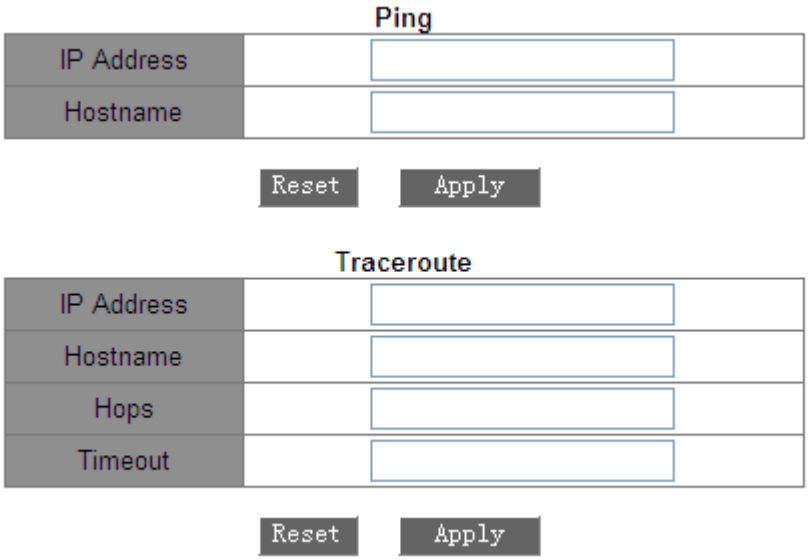
Click Device Basic Configuration→Basic Configuration Debug to open the submenu, which is

equivalent to CLI command in chapter 3.2.4.1. It contains:
Show Clock—which is equivalent to CLI command in chapter 3.2.4.1
Show Flash—which is equivalent to CLI command in chapter 3.2.4.3
Show Running-config—show efficient switch parameter configurations in current operation status, which is equivalent to CLI command in chapter 3.2.4.6
Show Switchport Interface--- show port VLAN properties, which is equivalent to CLI command in chapter 3.2.4.8
Show TCP—show current established TCP connection with switch, which is equivalent to CLI command in chapter 3.2.4.9
Show UDP-- show current established UDP connection with switch, which is equivalent to CLI command in chapter 3.2.4.10
Show Telnet Login—show all authorized Telnet clients which can access switch by Telnet,which is equivalent to CLI command in chapter 3.2.4.12

3.7.4.1 Debugging Commands

Click Device Basic Configuration→Basic Configuration Debug→Ping and Traceroute to enter configuration page, including ping and traceroute which are respectively equivalent to CLI commands in chapter 3.2.1 and 3.2.3
Explanations of Ping:
IP Address-destination IP address
Hostname

Explanations of Traceroute:
IP address-- destination IP address
Hostname
Hops-- max number of gateways which are passed through
Timeout-data packet timeout



3.7.4.2 Show Switchport Interface

Click Device Basic Configuration→Basic Configuration Debug→Show Switchport Interface to enter configuration page, which is equivalent to CLI command in chapter 3.2.4.8
Explanations:

Port-port list

Select port 1/1, click "Apply" to show its VLAN properties.

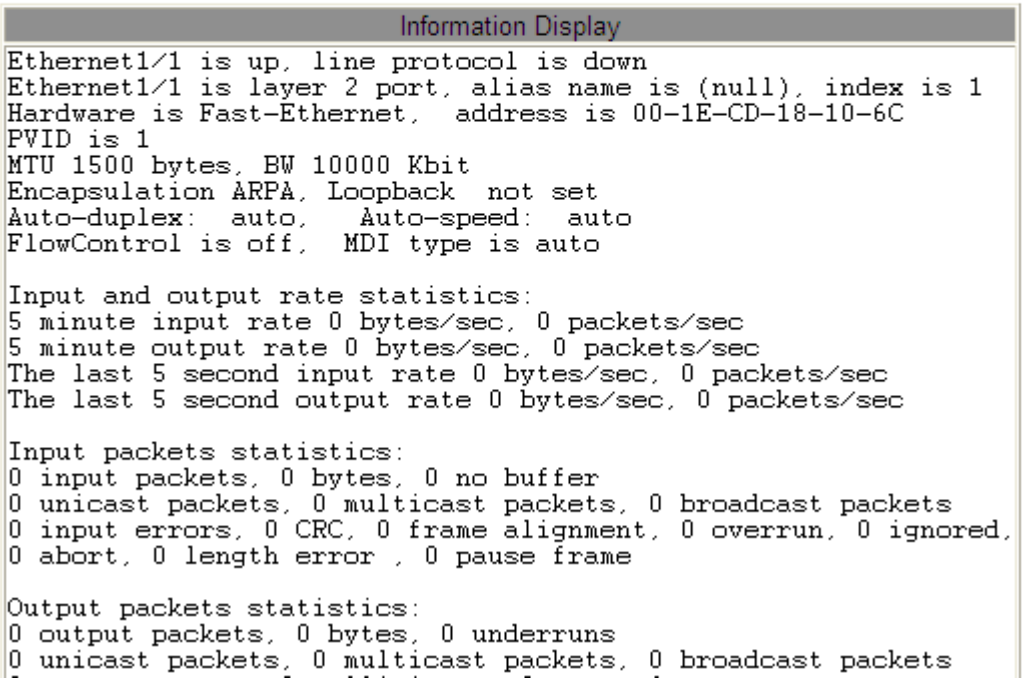


Figure 3-21: show port VLAN properties

3.7.4.3 Others

Click configuration link in the menu to show corresponding information, no need to input or select, such as Show Clock

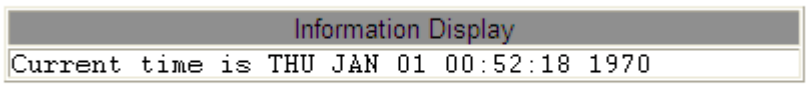


Figure 3-22: show clock

ShowFlash

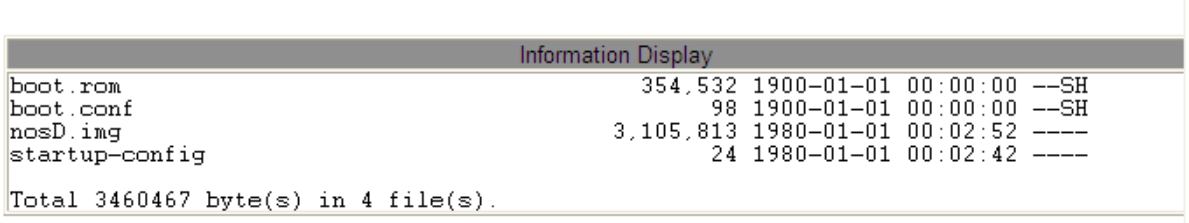


Figure 3-23: show flash

3.7.5 WEB Server User Configuration

Click Device Basic Configuration→Web Server User Configuration to configure Web user information.

Username-specify Web user's name

Password-set user password

Status (encryption or plain text)-set the password is in plain text or is encrypted.

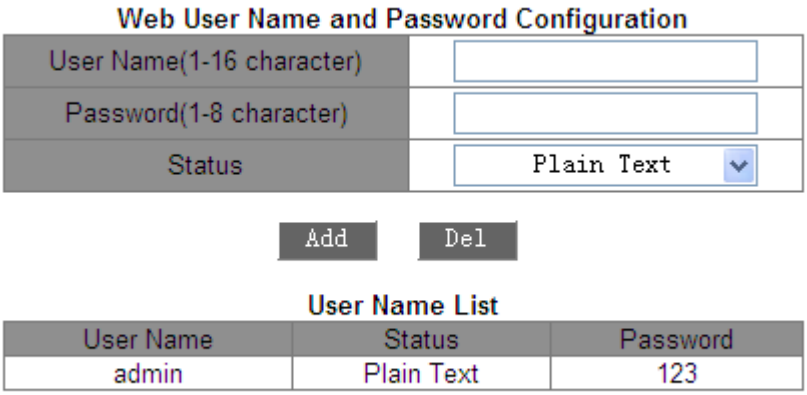


Figure 3-24 WEB username and password configuration

3.7.6 Telnet Server Configuration

Click Device Basic Configuration→Telnet Server Configuration→Telnet Server User Configuration to enable Telnet service and configure user information, which is equivalent to CLI command in chapter 3.2.2.3.3 and 3.2.2.3.5.

Telnet server status-- open or close, which is equivalent to CLI command 3.2.2.3.3

User Name-- specify Telnet user's name

Password-- set user password

Status (encryption or plain text)-set password is in plain text or is encrypted.

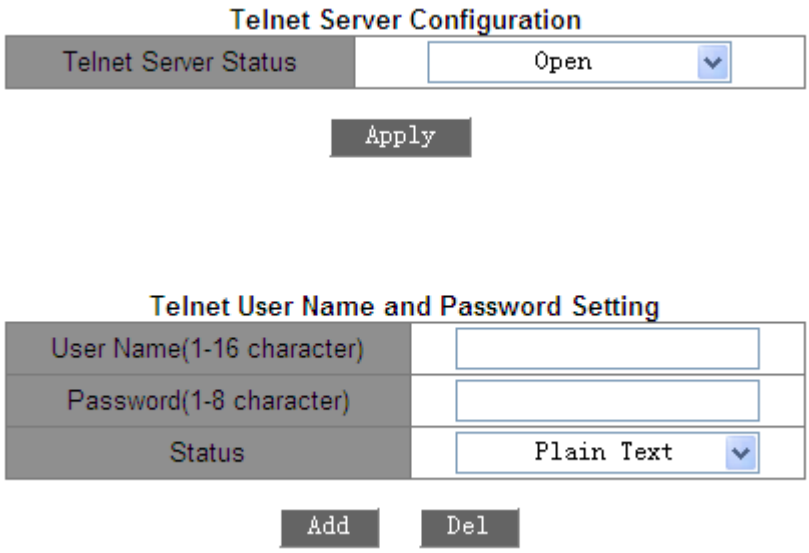


Figure 3-25 Telnet server configuration

Click Device Basic Configuration→Telnet Server Configuration→Telnet Security IP to set security IP of Telnet service, which is equivalent to CLI command in chapter 3.2.2.3.4

Security IP Address-- specifify security IP address

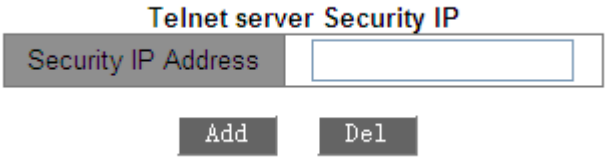


Figure 3-26 Telnet server security IP

3.7.7 Switch Maintenance

Click Switch Maintenance→Save Current Running-Config to enter the configuration page, click "Apply", which is equivalent to CLI command in chapter 3.1.14

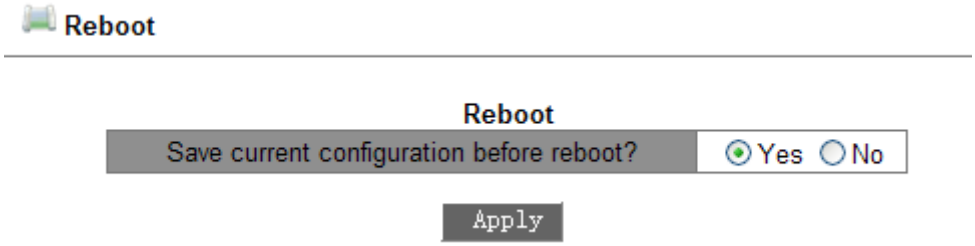


Figure 3-27 reboot

Click Switch Maintenance→Reboot with the Default Configuration to clear the current configuration and reboot the switch; after the reboot, switch goes with default configuration; which is equivalent to CLI command in chapter 3.1.11

3.7.8 LLDP Configuration

Click Device Advanced Configuration→LLDP Configuration→LLDP Configuration to open the configuration page.

LLDP Configuration-- enable or disable LLDP protocol, which is equivalent to CLI command in chapter 3.6.2.2.1

Chassis-id Setting—it is equivalent to CLI command in chapter 3.6.2.2.2

TLV Management Address—enable/disable, which is equivalent to CLI command in chapter 3.6.2.2.3

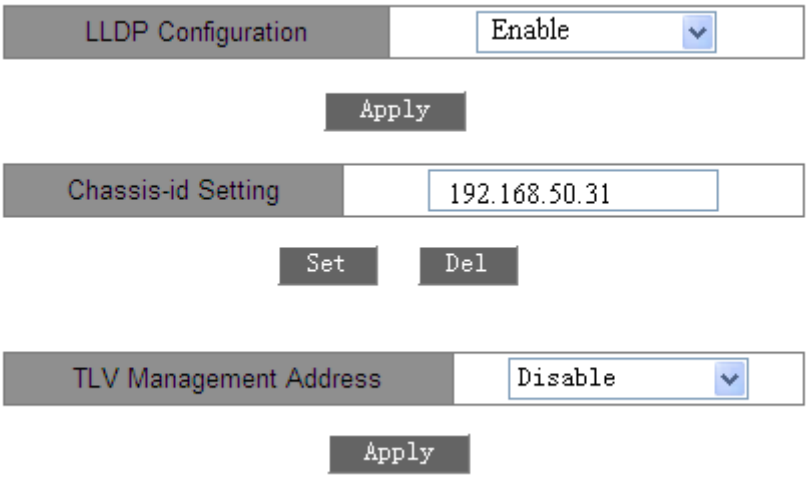


Figure 3-28 LLDP configuration

Click Device Advanced Configuration→LLDP Configuration→Show LLDP to check LLDP information,

which is equivalent to CLI command in chapter 3.6.4.1.1

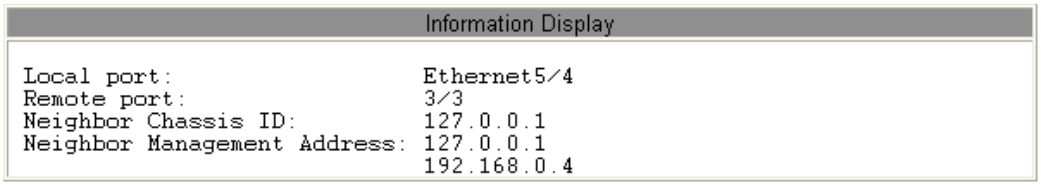


Figure 3-29 LLDP information

Chapter 4 Interface Configuration

4.1 Interface Introduction

In SCIOM6496 modules, interface numbers are marked on their panel. In order to distinguish interfaces on different panel, interface number (in the software sense) provided by SICOM6496 operation system is ethernet X/Y.

If user wants to configure a interface, they can user command **interface ethernet *<interface-list>*** to enter interface configuration mode. Parameter ***<interface-list>*** is one or more interfaces, when ***<interface-list>*** contains multiple interfaces, they can be connected with "," and "-", etc special characters. "," is to connect discontinuous interface numbers, "-" is to connect continuous interface numbers. In interface configuration mode, port speed, duplex mode, flow control, etc can be configures and their corresponding physical interfaces will also change.

4.2 Interface Configuration

4.2.1 Ethernet Interface Configuration

4.2.1.1 Task Sequence of Ethernet interface Configuration

1. Enter Ethernet interface configuration mode
2. Configure the properties of Ethernet interface
    1) enable or disable interface
    2) configure interface name
    3) configure the type of interface cable
    4) configure interface speed
    5) configure interfacet duplex mode
    6) configure bandwidth control
    7) configure flow control
    8) enable or disable port loopback function
    9) configure switch broadcast storm control function

1. Enter Ethernet interface configuration mode

Command	Explanation
Interface configuration mode	
interface ethernet *<interface-list>*	Enter Ethernet interface configuration mode

2. Configure the properties of Ethernet interface

Command	Explanation
Interface configuration mode	
shutdown **no shutdown**	Open or close designated interface
name *<string>* **no name**	Set or cancel the name of designated interface
mdi { auto | across | normal } **no mdi**	Set the cable type of designated interface. Gigabit ports in SICOM6496 do not support this command

speed {auto| force10| force100| force1000}	Set the speed of designated interface. Fiber ports in SICOM6496 do not support this command
duplex {auto| full| half}	Setting duplex mode of designated interface. Fiber ports in SICOM6496 do not support this command
bandwidth control <*bandwidth*> [both | receive | transmit] **no bandwidth control**	Setting or cancel bandwidth which are occupied by designated ports on transmitting and receiving data
flow control **no flow control**	Enable or disable flow control function of designated interface
loopback **no loopback**	Enable or disable loopback test function of designated interface
Rate-suppression {dlf | broadcast | multicast} <packets>	Enable switch broadcast storm (multicast, un-known unicast) control function and set the number of broadcast packets which are allowed to pass through per second; no command is to delete broadcast storm (multicast, un-known unicast) control function

4.2.1.2 Ethernet interface configuration mode

4.2.1.2.1 bandwidth

Command: **bandwidth control <*bandwidth*> [both | receive | transmit]**

no bandwidth control

Function: enable interface bandwidth control function; no command is to disable interface bandwidth control function

Parameter: ***<bandwidth>*** is to limit bandwidth. The unit is Mbps in a range of 1-10000M; **both** means bandwidth control in all port transmission and receiving; **receive** means port bandwidth control in port receiving data; **transmit** means bandwidth control in port transmitting data.

Command mode: interface configuration mode

Default: disable bandwidth control function

User guide: If port enable bandwidth control function and its bandwidth is specified. the max bandwidth is limited, it isn't 10/100/1000M. If no specify the keyword of **[both | receive | transmit]**, the default is **both**.

Note: the max bandwidth of port can't exceed the greatest possible port speed. For example: a 10/100M Ethernet port can't be set the max bandwidth to 101M (or more than 101M), but when a 10/100/1000M port works on 100M, its max bandwidth can be set to 101M (or more than 101M) in flow control.

Example: set the max bandwidth of port with the number 1-8 in slot 3 module to 40M

SWITCH(Config)#interface ethernet 3/1-8

SWITCH (Config-Port-Range)#bandwidth control 40 both

4.2.1.2.2 duplex

Command: **duplex {auto| full| half }**

Function: set the duplex mode for designated interface

Parameter: **auto** means duplex mode is auto-negotiation; **full** is forced to full duplex, **half** is forced to half-duplex

Command mode: interface configuration mode

Default: auto-negotiation

User guide: according to IEEE802.3 protocol, auto-negotiation of port speed and duplex are uinified. When port duplex mode is set to be auto-negotiation, the port speed will be automatically set to be auto-negotiation. When port duplex mode change from auto-negotiation to forced full duplex or half duplex, port speed will also change to forced mode and the forced speed will be the port speed before the command operation. Please be noted that the duplex mode of fiber ports in SICOM6496 modules can't be configured by user, which only adopts auto-negotiation mode. And the port which speed has been forced to 1000M can't be configured to half duplex.

We recommend user to set port speed and duplex mode to auto-negotiation, so as to prevent the connection problems caused by protocols. If ports have to be set to forced speed/duplex, please ensure the speed/duplex at two sides are the same, and both are forced speed/duplex.

Example: set the ports with number 1/1-8 to forced full duplex mode

SWITCH (Config)#interface ethernet1/1-8

SWITCH (Config-Port-Range)#duplex full

4.2.1.2.3 flow control

Command: **flow control**

no flow control

Function: enable flow control function for designated port; no command is to disable port flow control function

Command mode: interface configuration mode

Default: flow control function is disabled.

User guide: after opening port flow control function, if the port flow exceed the port buffering capacity, port will inform the device which transfer flows through calculation or protocol to reduce the sending speed to avoid packet loss. Switch port supports back pressure-based 802.3X flow control. When port works in half duplex mode, back pressure flow control is supported. When back pressure control reach serious HOL, switch will automatically control HOL (drop the packets which caused HOL in COS queue) to avoid a sharp decrease in network performance.

Note: unless user need a network with low speed, poor performance and minor packet loss, otherwise it is recommended to disable port flow control function. The flow control doesn't work in different modules of SICOM6496. Before opening port flow control, please ensure port speed and duplex mode are same in two ends.

Example: enable flow control function in port 1/1-8

SWITCH (Config)#interface ethernet 1/1-8

SWITCH (Config-Port-Range)#flow control

4.2.1.2.4 interface ethernet

Command: **interface ethernet *<interface-list>***

Function: enter ethernet interface configuration mode from global configuration mode

Parameter: ***<interface-list>*** is port number.

Command mode: global configuration mode

User guide: use **exit** command to exit from Ethernet interface configuration mode and return to global configuration mode

Example: enter Ethernet port 1/1; 2/4-5; 3/8
SWITCH (Config)#interface ethernet 1/1;2/4-5;3/8
SWITCH (Config-Port-Range)#

4.2.1.2.5 loopback

Command: **loopback**

no loopback

Function: set ethernet port to do loopback test; no command is to cancel Ethernet port loopback test
Command mode: interface configuration mode
Default: do not execute loopback test
User guide: use loopback test to test if Ethernet ports are working normally. After setting loopback, port will suppose a connection with itself, so the flow sent from this port will be received by itself.
Example: setting port 1/1-8 to do loopback test
SWITCH (Config)#interface ethernet 1/1-8
SWITCH (Config-Port-Range)#loopback

4.2.1.2.6 mdi

Command: **mdi { auto | across | normal }**

no mdi

Function: set cable types of port; no command is to set the type to automatic recognition. Gigabit ports in SICOM6496 modules do not support this command. Their cable types are automatic recognition
Parameter: **auto** means auto-recognition in cable types, **across** means port supports cross cable. **normal** means port support straight through cable.
Command mode: interface configuration mode
Default: auto-recognition
User guide: auto-recognition is recommended to user. Generally, switch and PC are connected through straight through cables. Cross over cables are used between switches.
Example: set Ethernet port 3/5-8 only support straight through cables
SWITCH (Config)#interface ethernet 3/5-8
SWITCH (Config-Port-Range)#mdi normal

4.2.1.2.7 name

Command: **name *<string>***

no name

Function: set name fordesignated port; no command is to delete this configuration
Parameter: ***<string>*** is a string with max 200 characters
Command mode: interface configuration mode
Default: no name
User guide: this command is helpful for user to manage switch. User can set a name according the port using situation, such as port 1/1-2 are used by financial department, so they are defined with a name financial; 2/9 is for engineering department, so you can use engineering to define them. 3/12 port are to connect server, so they are defined to Servers. After these settings, all using status are clear to users.
Example: set port 1/12 with a name of financial
SWITCH (Config)#interface ethernet 1/1-2
SWITCH (Config-Port-Range)#name financial

4.2.1.2.8 rate-suppression

Command: **rate-supppression {dlf | broadcast | multicast} <packets>**

no rate-suppression {dlf | broadcast | multicast}

Function: set flow of broadcast, multicast and unknown address unicast in all ports; no command is disable broadcast, multicast, address-unknown unicast flow control function, that means broadcast, multicast and address unknown unicast flow pass through ports with wire speed

Parameter: **dft** means address unknown unicast flow control, **multicast** means multicast flow control, **broadcast** means broadcast flow control. ***<packets>*** is a number of packets which are allowed to pass through ports per seconds, except 10G ports. For 10G ports, the number of packets which go through ports per second multiply 1040 with a range of 1~262143.

Command mode: interface configuration mode

Default: no limit, it allowed broadcast, multicast and address unknown unicast flow going through with wire speed

User guide: without setting VLAN, all ports in switch are in a same broadcast domain. For the above three types of flow, they are transmitted to all ports in switch, which might cause broadcast storm. Broadcast storm extremely affect switch performance. Enable broadcast storm control function to protect switch against broadcast storm effect at the lowest level. Please be noted that the meaning of this command for 10G ports and other ports are different. When set the broadcast flow in 10G to 3, it means when the number of broadcast packets received per second is more than 3120, the part of out of 3120 will be dropped. For other ports, the same setting means when the number of broadcast packets received per second is more than 3, the part of out of 3 will be dropped.

Example: set the max number of broadcast data packets received per second is 3 in ports 8-10 (Gigabit) in switch slot 2.

SWITCH (Config)#interface ethernet 2/8-10

SWITCH (Config-Port-Range)#rate-suppression broadcast 3

4.2.1.2.9 shutdown

Command: **shutdown**

no shutdown

Function: shutdown designated Ethernet ports; no command is to open the port

Command mode: interface configuration mode

default : port is in open

User guide : when ethernet ports are shutdown, ethernet ports won't transmit data frames and if user input **show interface** command, the port state is **down.**

Example: open port with number 1/1-8

SWITCH (Config)#interface ethernet1/1-8

SWITCH (Config-Port-Range)#no shutdown

4.2.1.2.10 speed

Command: **speed {auto| force10| force100| force1000}**

Function: set speed for designated port

Parameter: **auto** is auto-negotiation speed; **force10** means forced 10Mbit/s speed; **force100** means forced 100Mbit/s speed; **force1000** means forced 1000Mbit/s speed.

Command mode: interface configuration mode

Default: auto-negotiation speed

User guide: according to IEEE802.3 protocol, the auto-negotiation of port speed and duplex mode are

unified. When port speed is set to be auto-negotiation, duplex mode of port will be automatically set to be auto-negotiation. When port seed mode change from auto-negotiation to forced, the duplex mode of port will also change to forced full duplex mode. Please be aware that the speed of fiber ports in modules of SICOM6496 can't be set by users, they adopt auto-negotiation mode. If port is forced with 1000M speed, the duplex mode will changed to forced full-duplex.

It is recommend that the port speed mode and duplex mode are set to be auto-negotiation, in this way to avoid the problems in connection caused by protocols. If forced speed/duplex are required by user, please ensure the speed/duplex at two sides are the same, both are forced speed/duplex.

Example: copper port 2/5-8 are set to be forced 100Mbit/s.

SWITCH (Config)#interface ethernet 2/5-8

SWITCH (Config-Port-Range)#speed force100

4.2.2 VLAN interface configuration

4.2.2.1 Task Sequence of VLAN interface configuration

1. Enter VLAN interface configuration mode
2. Configure IP address of VLAN interface and enable VLAN interface

1. Enter VLAN interface configuration mode

Command	explanation
Global configuration mode	
interface vlan *<vlan-id>* **no interface vlan *<vlan-id>***	Enter VLAN interface configuration mode or delete existing VLAN interfaces

2. Configure IP address of VLAN interface and enable VLAN interface

Command	explanation
VLAN interface configuration mode	
ip address *<ip-address>* *<mask>* [secondary] **no ip address [*<ip-address>* *<mask>*]**	Configure IP address of VLAN interface
VLAN interface configuration mode	
shutdown **no shutdown**	Enable or disable VLAN interface

4.2.2.2 VLAN interface configuration commands

4.2.2.2.1 interface vlan

Command: **interface vlan *<vlan-id>***

no interface vlan *<vlan-id>*

Function: enter VLAN interface configuration mode; no command is to delete existing VLAN interface

Parameter: ***<vlan-id>*** is VLAN ID for existing VLAN with a range of 1~4094

Command mode: global configuration mode

User guide: before setting a VLAN interface, please ensure it is existing. Use **exit** command to exit from VLAN interface configuration mode and return to global configuration mode

Example: enter VLAN1 interface configuration mode

SWITCH (Config)#interface vlan 1

SWITCH (Config-If-Vlan1)#

4.2.2.2.2 ip address

Command: **ip address *<ip-address>* *<mask>* [secondary]**

no ip address [*<ip-address>* *<mask>*] [secondary]

Function: set switch IP address and mask; no command is to delete IP address configuration

Parameter: ***<ip-address>*** is IP address with dot-decimal format. ***<mask>*** is subnet mask with dot-decimal format. **[secondary]** means IP address is secondary IP address

Command mode: VLAN interface configuraitonmode

Default: no IP address configuration

User guide: this command is to manually configure IP address of VLAN interface. If no configure optional parameter secondary, it means thia IP address is maste IP address of VLAN interface. If set parameter secondary, it means the IP address is a secondary IP address of of VLAN interface. A VLAN interface only has a master IP address, but several secondary IP addresses. Master IP address and secondary IP addresses can be managed by SNMP/WEB/Telnet. Besides, SICOM6496 also provides BOOTP/DHCP mode to obtain IP address.

Example: set the IP address of VLAN1 interface to 192.168.1.10/24

SWITCH (Config-If-Vlan1)#ip address 192.168.1.10 255.255.255.0

4.2.2.2.3 shutdown

Command: **shutdown**

no shutdown

Function: disable designated VLAN interface in switch; no command is to open VLAN interface

Command mode: VLAN interface configuration mode

Default: disable VLAN interface

User guide: when close VLAN interface, it won't transmit data frames. If switch VLAN interface obtain IP address through BOOTP/DHCP protocol. VLAN interface must be enabled.

Example: enable switch VLAN1 interface

SWITCH (Config-If-Vlan1)#no shutdown

4.2.3 Network management interface configuration

4.2.3.1 Task sequence of network interface configure

1. enter network management interface configuration mode
2. configure the propertities of network management interface
   1) enable or disable interface
   2) configure port speed
   3) configure port duplex mode
   4) enable or disable port loopback function
   5) configure port IP address

1. Enter network management interface configuration mode

Command	explanation
Global configuration mode	
interface ethernet *<num>*	Enter network management interface configuration mode

2. Configure the properties of ethernet interface

Command	explanation

Network management interface configuration mode	
shutdown **no shutdown**	Enable or disable designated ports
speed {auto| force10| force100| }	Setting speed of deignated port
duplex {auto| full| half}	Setting duplex mode of designated port
loopback **no loopback**	Enable or disable loopback test functionin designated port
ip address <ip-address> <mask> **no ip address [<ip-address> <mask>]**	Configure port IP address or delete configuration

4.2.3.2 network management interface configuration commands

4.2.3.2.1 duplex

Command: **duplex {auto| full| half }**

Function: set duplex mode of network management interface

Parameter: **auto** is auto-negotiation duplex mode; **full** is forced full duplex mode, **half** is forced half duplex mode.

Command mode: network management interface configuration mode

Default: auto-negotiation duplex mode

User guide: according to IEEE802.3 protocol, the auto-negitiation of port speed and duplex mode are unified. When port duplex mode is set to be auto-negotiation, port speed will be automatically set to be auto-negotiation. When port duplex mode change from auto-negotiation to forced full/half duplex, the port speed will change to forced mode. Now the forced speed is the port speed before operating command.

It is recommend that the port speed and duplex mode are set to be auto-negotiation, in this way to avoid the problems in connection caused by protocols. If forced speed/duplex are required by user, please ensure the speed/duplex are the same in two side which are connected, both are forced speed/duplex.

Example: setting network management interface to forced full duplex mode

SWITCH (Config)#interface ethernet 0

SWITCH (Config-Ethernet0)#duplex full

4.2.3.2.2 interface ethernet

Command: **interface ethernet *<interface-list>***

Function: enter network management interface configuration mode from global configuration mode

Parameter: ***<interface-list>*** is port number "0"

Command mode: global configuration mode

User guide: use **exit** command to exit from network management interface configuration mode to global configuration mode

Example: enter network management interface

SWITCH (Config)#interface ethernet 0

SWITCH (Config-Ethernet0)#

4.2.3.2.3 ip address

Command: **ip address *<ip-address> <mask>***

no ip address [*<ip-address> <mask>*]

Function: set switch IP address and mask; no command is to delete IP address configuration

Parameter: ***<ip-address>*** is IP address with dot-decimal format. ***<mask>*** is subnet mask with dot-decimal format.
Command mode: network management interface configuration mode
Default: no IP address configuration
User guide: use this command to set IP address of network management interface
Example: set the IP address of network management to 192.168.1.10/24.
SWITCH (Config-Ethernet0)#ip address 192.168.1.10 255.255.255.0

4.2.3.2.4 loopback

Command: **loopback**

no loopback

Function: set network management interface to do loopback test; no command is to cancel network management interface loopback test
Command mode: network management interface configuration mode
Default: do not execute loopback test on network management interface
User guide: use loopback test to test if network management interface is working normally. After setting loopback, port will suppose a connection with itself, so the flow sent from this port will be received by itself.
Example: setting network management interface to do loopback test
SWITCH (Config)#interface ethernet 0
SWITCH (Config-Ethernet0)#loopback

4.2.3.2.5 shutdown

Command: **shutdown**

no shutdown

Function: close network management interface; no command is to open port
Command mode: network management interface configuration mode
Default: network management interface is open
User guide: when shutdown network management interface, it won't transmit data frames and if user input **show interface** command, the port state is **down**
Example:open network management interface
SWITCH (Config)#interface ethernet 0
SWITCH (Config-Ethernet0)#no shutdown

4.2.3.2.6 speed

Command: **speed {auto| force10| force100}**
Function: setting port speed
Parameter: **auto** is auto-negotiatin speed; **force10** means forced 10Mbit/s speed; **force100** means forced 100Mbit/s speed
Command mode: network management interface configuration mode
Default: auto-negotiation speed
User guide: according to IEEE802.3 protocol, the auto-negotiation of port speed and duplex mode are unified. When port speed is set to be auto-negotiation, duplex mode of port will be automatically set to be auto-negotiation. When port seed mode change from auto-negotiation to forced, the duplex mode of port will change to forced full duplex mode.
It is recommend that the port speed mode and duplex mode are set to be auto-negotiation, in this way to avoid the problems in connection caused by protocols. If forced speed/duplex are required by

user, please ensure the speed/duplex are the same in two side which are connected, both are forced speed/duplex.

Example: setting network management interface speed to forced 100Mbit/s.

SWITCH (Config)#interface ethernet 0

SWITCH (Config-Ethernet0)#speed force100

4.2.4 port mirroring configuration

4.2.4.1 port mirroring introduction

Port mirroring function means switch copy the transmitting and receiving data frames in a port (called mirror source port) to another port (called mirror destination port). Generally, connect a protocol analyzer (such as Sniffer) or RMON monitor with mirror destination port to monitor or manage network and diagnose network faults.

SICOM6496 only support one mirror destination port, but no limit on mirror source port, one or more than one. They can be in a same VLAN or not in a same VLAN. Destination port and source port can be in different VLAN.

4.2.4.2 task sequence o port mirroring configuration

1. designate mirror source port
2. designate mirror destination port

1. Designate mirror source port

command	explanation
Global configuration mode	
monitor session *<session>* source interface *<interface-list>* {rx| tx| both} **no monitor session *<session>* source interface *<interface-list>***	Designate mirror source port; no command is to delete mirror source port

2. designate mirror destination port

Command	解释
Global configuration mode	
monitor session *<session>* destination interface *<interface-number>* [tag {*all* | *preserve* }] **no monitor session *<session>* destination interface *<interface-number>***	designate mirror destination port; no command is to delete mirror destination port

4.2.4.3 port mirroring configuration

4.2.4.3.1 monitor session source interface

Command: **monitor session *<session>* source interface *<interface-list>* {rx| tx| both}**

no monitor session *<session>* source interface *<interface-list>*

Function:designate mirror source port; no command is to delete mirror source port

Parameter: ***<session>*** is mirror session value, only supporting "1" at present; ***<interface-list>*** is mirror source port list, supporting "-" "," etc special characters; **rx** means the flow which mirror source port receive; **tx** is the flow which mirror source port transmit; **both** means in and out flow of mirror source port

Command mode: global configuration mode

User guide: this command is to set mirror source port. SICOM6496 has no limit in source port,

supporting one or more than one ports. it not only can mirror port in and out flow, but also singly mirror in or out flow of mirror source port. If no specify **[rx|tx|both]** keywords, **both** is at default. When mirror multiple ports. the directions of source ports can be different, but they need to be set separately.

Example: setting the out flow of mirror source port 1/1-4 and in flow of mirror source port 3/5

SWITCH (Config)#monitor session 1 source interface ethernet 1/1-4 tx

SWITCH (Config)#monitor session 1 source interface ethernet 3/5 rx

4.2.4.3.2 monitor session destination interface

Command: **monitor session *<session>* destination interface *<interface-number>* [tag {*all* | *preserve* }]**

no monitor session *<session>* destination interface *<interface-number>*

Function: specify mirror destination port; no command is to delete mirror destination port

Parameter: ***<session>*** is mirror session value, only supporting "1" at present; ***<interface-number>*** is mirror destination port; **tag** is to set vlan tag of mirroring packets which are transmitted from mirror source port; **all** means all mirroring packets have vlan tag; **preserve** means if mirrored packets have vlan tag when they entering switch, the mirroring packets also have vlan tag; if mirrored packets do not have vlan tag when entering switch, the mirroring packets do not have vlan tag, either.

Default: if no specify tag mode, the default tag mode is preserve.

Command mode: global configuration mode

User guide: SICOM6496 only support one mirror destination port. Please be noted that the port served as mirror destination port can't be a member of Port Trunking group and the port throughput should be equal or more than the sum of throughputs of its mirror source ports

Example: set port 4/7 to be mirror destination port

SWITCH (Config)#monitor session 1 destination interface ethernet 4/7

4.2.4.4 port mirroring example

Please refer to port configuration example

4.2.4.5 port mirroring troubleshooting help

4.2.4.5.1 show monitor

Command : **show monitor**

Function: show mirror source and destination ports information

Command mode: privilege user configuration mode

User guide: use this command to show existing mirror source and destination ports

Example: SWITCH#show monitor

4.2.4.5.2 port mirroring troubleshooting help

When problems occurs in port mirroring function configuration, please check if it is caused by following reasons

- ☞ Mirror destination port is a member of Port Trunking Group. If yes, please modify port trunking group
- ☞ The throughput of mirror destination port is less than the sum of throughput of mirror source ports, and destination port can't totally copy the flow of source port. Please reduce the number of source ports or reduce to copy one-way flow, or select another port with greater throughput to be destination port

4.3 port configuration example

Because no setting VLAN on switch, user default VLAN1

Switch	Port	Attribute
SW1	2/7	Ingress bandwidth limit, 150M
SW2	1/8	Mirror source port
	3/9	100M/full, mirror source port
	4/12	1000M/full, mirror destination port
SW3	3/10	100M/full

Configuration is as follows:

SW1：

Switch1(Config)#interface ethernet 2/7

Switch1(Config-Ethernet2/7)#bandwidth control 150 both

SW2：

Switch2(Config)#interface ethernet 3/9

Switch2(Config-Port-Range)#speed force100

Switch2(Config-Port-Range)#duplex full

Switch2(Config-Port-Range)#exit

Switch2(Config)#interface ethernet 4/12

Switch2(Config-Ethernet1/2)#speed force1000

Switch2(Config-Ethernet1/2)#duplex full

Switch2(Config-Ethernet1/2)#exit

Switch2(Config)#monitor session 1 source interface ethernet 1/8;3/9

Switch2(Config)#monitor session 1 destination interface ethernet 4/12

SW3：

Switch3(Config)#interface ethernet 3/10

Switch3(Config-Ethernet3/10)#speed force100

Switch3(Config-Ethernet3/10)#duplex full

4.4 port troubleshooting help

4.4.1 monitoring and debugging command

4.4.1.1 clear counters ethernet

Command: **clear counters [ethernet *<interface-list>*]**

Function: clear statistics of Ethernet port

Parameter: ***<interface-list>*** is Ethernet port number

Command mode: privilege user configuration mode

Default: do not clear statistics information of Ethernet port

User guide: if no specify port, delete all port statistics information

Example: clear statistics of ethernet port 1/1

SWITCH#clear counters ethernet 1/1

4.4.1.2 show interface ethernet

Command: show interface ethernet <interface-list>

Function: show specified port information

Parameter: ***<interface-list>*** is port number

Command mode: privilege user configuration mode

User guide: use this command to show information of port speed, duplex mode, flow control state, broadcast storm control state, data packet statistics, etc.

Example: show port 4/1 information

SWITCH#show interface ethernet 4/1

4.4.2 port troubleshooting help

User often meet following troubles in port configuration and their solutions are as below:

- ☞ When two fiber ports are connected, if one side is set to be auto-negotiation, the other side is set to be forced speed/duplex, so these two fiber ports won't link up, which depends on IEEE802.3 protocol
- ☞ Avoid following configuration
  - Enable a port flow control and set multicast control at the same time
  - Set a port broadcast, multicast or address unknown unicast control, and ser bandwidth control in a same port

  They might cause the port flow less than expected value.

4.5 WEB management

Click Device Basic Configuration→Port Configuration to open the submenu of port configuration User can manage switch port, such as setting port speed, duplex, etc.

4.5.1 Ethernet interface configuration

Click device basic configuration→port configuration→Ethernet Port Configuration to open the submenu of ethernet port configuration. User can configure ethernet port duplex, speed, bandwith control, etc.

4.5.1.1 Physical Port Configuration

Click device basic configuration→port configuration→Ethernet Port Configuration→Physical Port Configuration to configure following information:

- ☞ Port-s- designated port for configuration
- ☞ Cable types (Mdi)- set the cable types of ethernet port, **auto** means auto negotiation in cable types, **across** means only across over cables are supported, **normal** means port only support straight through cables, which is equivalent to CLI command in chapter 4.2.1.2.6
- ☞ Admin Status-- shutdown or no shutdown port, which is equivalent to CLI command in chapter 4.2.1.2.9
- ☞ Speed/Mode- setting ethernet port speed/duplex mode, including auto-negotiation, 10M/Half、10M/Full、100M/Half、100M/Full、1000M/Half、1000M/Full, which is equivalent to CLI command in chapter 4.2.1.2.2
- ☞ Port Flow Control Status-- setting port flow control. Invalid flow control, disable/enable flow control, which is equivalent to CLI command in chapter 4.2.1.2.3
- ☞ Loopback-- setting Ethernet port to do loopback test, which is equivalent to CLI command in chapter 4.2.1.2.5

Select port Ethernet3/1, set normal in cable type, no shutdown in management state, auto in speed/mode, invalid in flow control, no loopback in loopback, click "Apply" to complete the configuration in port 3/1

Port Configuration

Port	Mdi	Admin Status	Speed/Duplex Status	Port Flow Control Status	Loopback
Ethernet1/1	auto	no shutdown	auto	Invalid	no loopback

Apply

Port List

Port	Mdi	Status	Admin Status	Speed	Mode	Flow Control	loopback
Ethernet1/1	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet1/2	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet1/3	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet1/4	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet1/5	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet1/6	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet1/7	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet1/8	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/1	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/2	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/3	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/4	auto	up	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/5	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/6	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/7	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet2/8	auto	down	no shutdown	auto	auto	Invalid	no loopback
Ethernet3/5	auto	down	no shutdown	100M	full	Invalid	no loopback
Ethernet3/6	auto	down	no shutdown	100M	full	Invalid	no loopback

Figure 4-1 port configuraiton

4.5.1.2 Bandwidth Control

Click device basic configuration→port configuration→Ethernet Port Configuration→Bnadwidth Control to control port bandwidth, which is equivalent to CLI command in chapter 4.2.1.2.1

- Port-- specify port for configuration
- Bandwidth control level-- port bandwidth control with the unit of Mbps and in a rang e of 1-1000M
- Control type- **Ingress and Egress** means bandwidth control in port transmitting and receiving data; **ingress** means bandwidth control in switch receiving data; **Egress** means bandwidth control in switch transmitting data

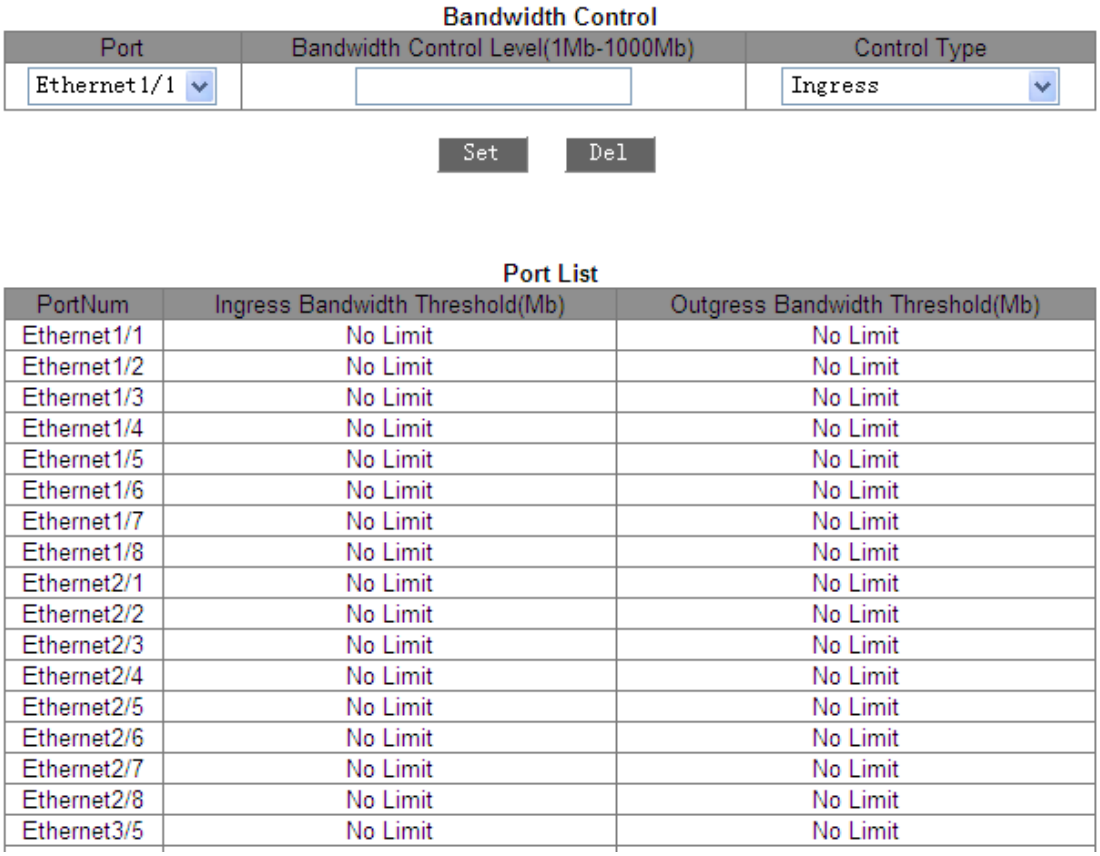


Figure 4-2 bandwidth control

4.5.2 Layer 3 interface configuration

Click Device Advanced Configuration→L3 Interface Configuration to open the submenu. Use can configure layer 3 port IP address, mask, etc

4.5.2.1 layer 3 port IP address configuration

Click Device Advanced Configuration→L3 Interface Configuration→Allocate IP address for L3 port to configure layer 3 port IP address, which is equivalent to CLI command in chapter 4.2.2.2.2.

- Port-- layer 3 port name
- Port IP Address-- layer 3 port IP address
- Port Network Mask-- layer 3 port IP address mask
- Port Status- layer 3 port state

Select port VLAN1, input IP address 2.2.2.20, port mask 255.255.255.0, select no shutdown in port state, click "Add" to complete configuration

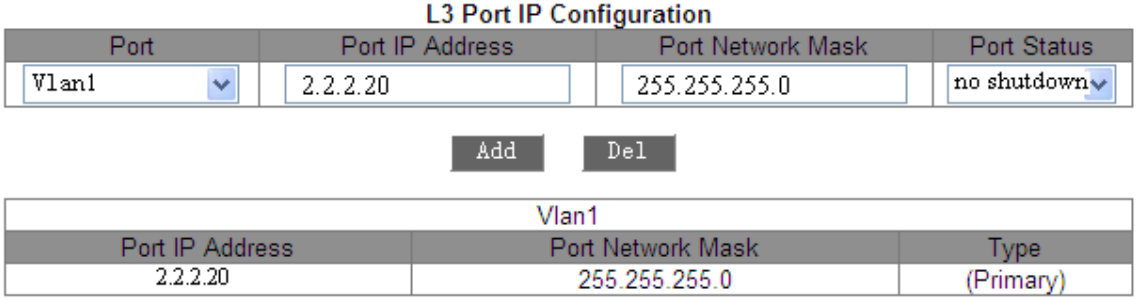


Figure 4-3 Layer 3 port IP address configuration

4.5.2.2 Layer 3 port IP address mode configuration

Click Device Advanced Configuration→L3 Interface Configuration→L3 Port IP Address Mode Configuration to configure layer 3 port IP address obtaining mode.

- Port-- layer 3 port name
- IP mode-**specify IP address** means user need to manually configure layer 3 port IP address; **bootp-client** is to obtain IP address and gateway address thorough BootP negotiation mode, which is equivalent to CLI command in chapter 4.3.2.2; **dhcp-client** is to obtain IP address and gateway address through DHCP negotiation mode, which is equivalent to CLI command in chapter 4.3.2.2

Select layer 3 port VLAN1, select" specify IP address" in address obtaining mode, click "Apply" to complete configuration

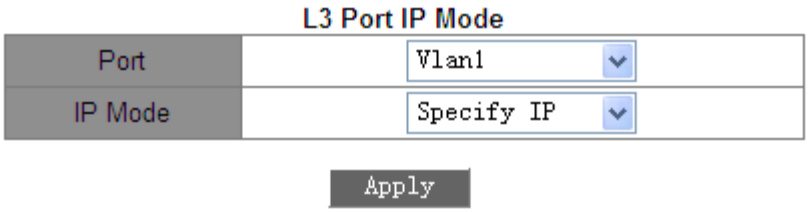


Figure 4-4 layer 3 port automatically obtaining IP address

4.5.3 port mirroring configuration

Click Device Basic Configuration→Port Configuration→Port Mirroring Configuration to open the submenu of port mirroring configuration. User can operate port mirroring configuration.

4.5.3.1 Mirror configuration

Click Device Basic Configuration→Port Configuration→Port Mirroring Configuration→Mirror configuration to configure port mirroring function, including mirror source port and mirror destination port configuration

Mirror source port configuration, which is equivalent to CLI command in chapter 4.2.3.3.1

- Session- - mirror session value
- Mirror Direction-- **rx** means mirroring port receiving data; **tx** is to mirror port transmitting data; **both** means mirroring port receiving and transmitting data
- Source port- mirror source port list

Select session 1, select Ethernet2/1 in mirror source port, rx in mirror direction, click 'Apply" to finish configuration

Mirror destination port configuration, which is equivalent to CLI command in chapter4.2.3.3.2

- Session-- mirroring session value
- Destination port-- mirror destination port
- Tag-- set vlan tag of mirroring packets which are transmitted from mirror destination port; **all** means all mirroring packets have vlan tag; preserve means if mirrored packets have vlan tag when they entering switch, the mirroring packets also have vlan tag; if mirrored packets do not have vlan tag when entering switch, the mirroring packets do not have vlan tag, either.

Select session 1, select Ethernet2/2 in destination port, preserve in tag, click "Apply" to complete configuration

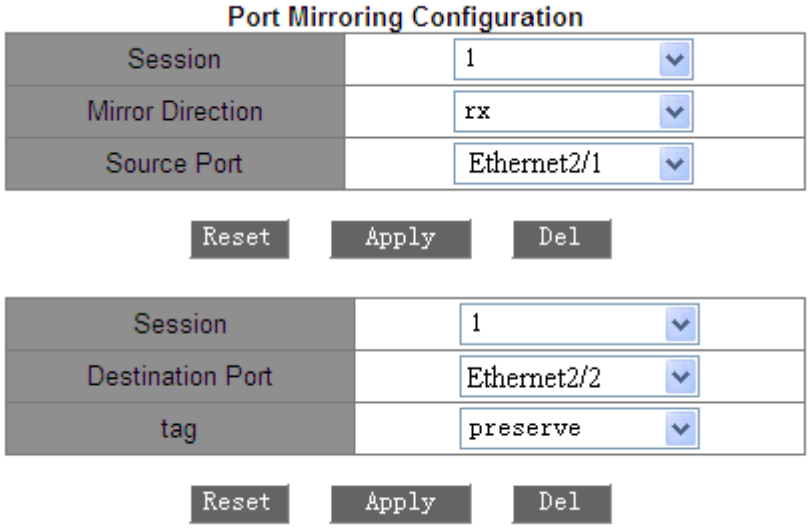


Figure 4-5 port mirroring configuration

4.5.4 Port Debug and Maintenance

Click Device Basic Configuration→Port Configuration→Port Debug and Maintenance to open the submenu. User can get port information.

4.5.4.1 Show port information

Click Device Basic Configuration→Port Configuration→Port Debug and Maintenance→Show port information to check statistics of port receiving and transmitting data packets, which is equivalent to CLI command in chapter 4.4.1.2

Select port Etherent1/1, click “Refresh” to view data packet statistics of Ethernet1/1

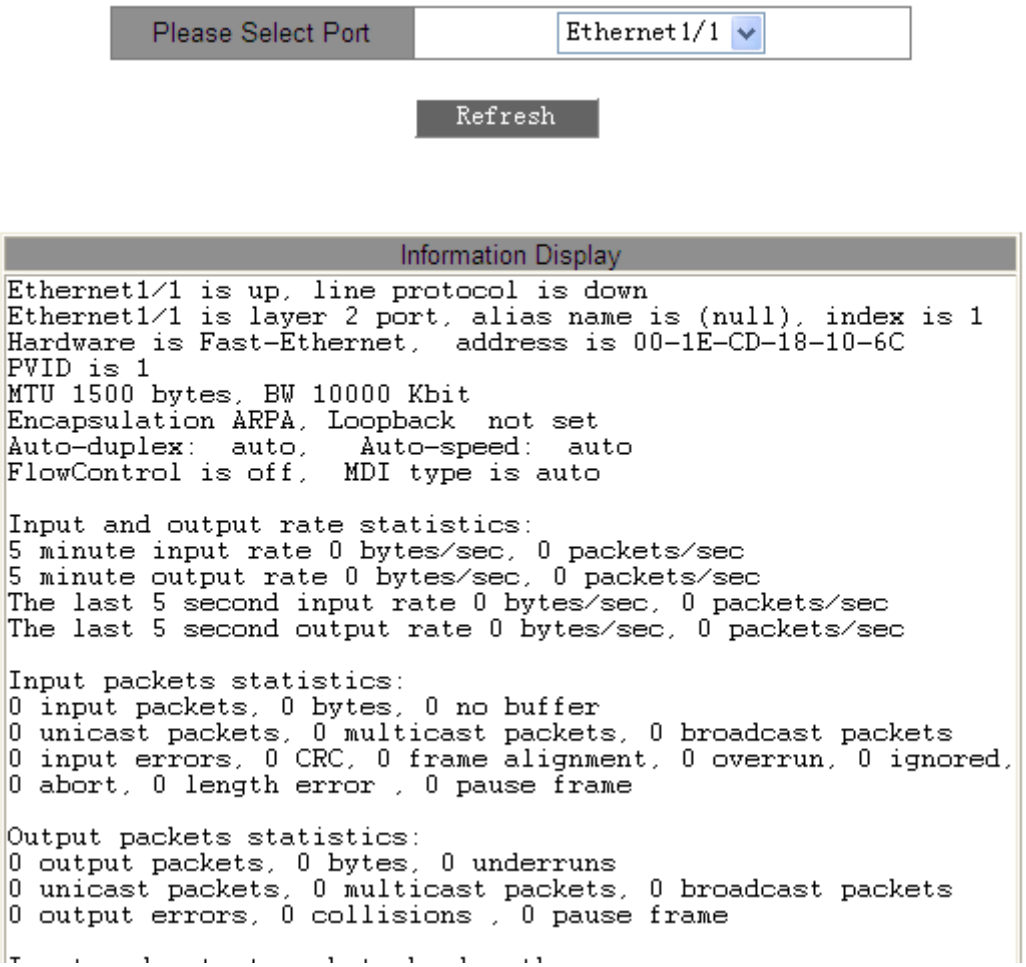


Figure 4-6: port information

Chapter 5 MAC Address Table Configuration

5.1 MAC address table introduction

MAC address table is a table to identify the mapping relationships of destination MAC address and switch port. MAC address is divided to static MAC address and dynamic MAC address. Static MAC address is set by user and has highest priority (can't be covered by dynamic MAC address) and is always valid. Dynamic MAC address is learned by switch in transmitting data frames and it is valid in limited time. When switch receive a data frame which is need to be transmitted, it learn source MAC address of the data frame to establish mapping relationship with receiving port, then inquire MAC address table according to destination MAC address. If find the correct address, switch will transmit the data frame from corresponding port, otherwise, switch will broadcast the data frame in its broadcast domain. If dynamic MAC address couldn't be learned from data frames for a long time, switch will delete it from MAC address table.

MAC address table operation can be divided to two parts:

1. MAC address obtaining
2. Forwarding or filtering according to MAC address table

5.1.1 MAC address table obtaining

MAC address table obtaining can be divided into static configuration and dynamic learning. Static configuration means user manually establish mapping relationship of MAC address and port; dynamic learning means switch dynamically find out the mapping relations of MAC address and port and update MAC address table regularly. Next we attach importance to dynamic learning of MAC address table.

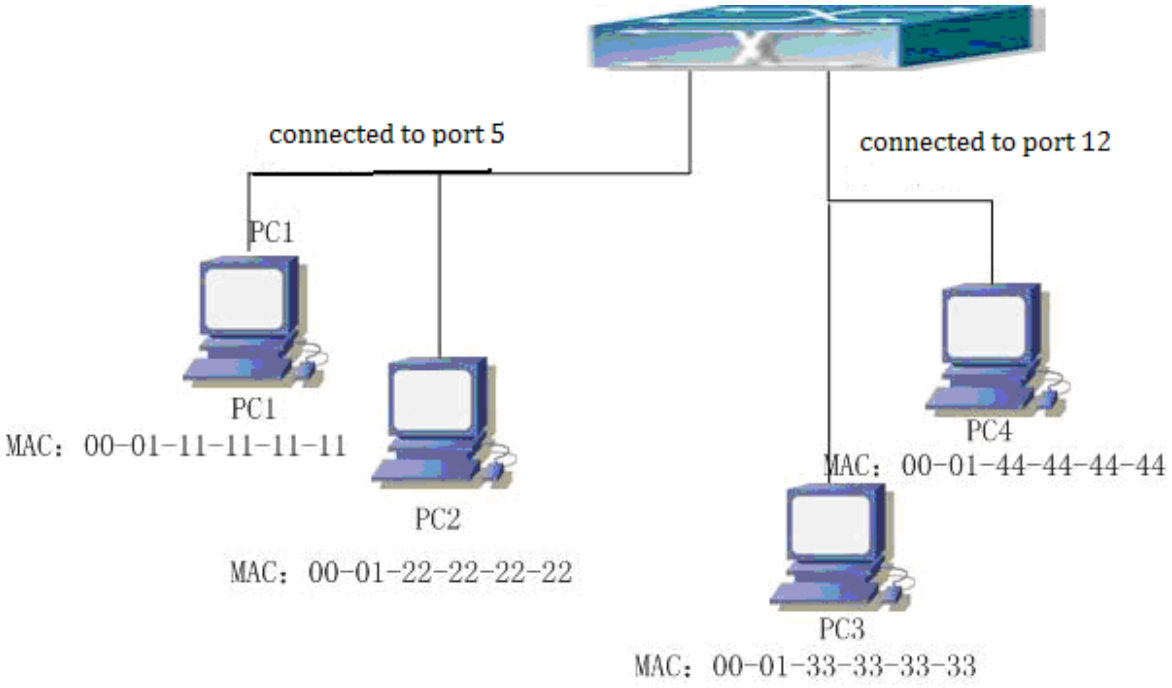


Figure 5-1: MAC address table dynamic learning

In above topology, 4 PCs are connected with SICOM6496. PC1 and PC2 are in a same physical segment (means in a same collision domain). This physical segment is connected with SICOM6496 port1/5. PC3 and PC4 are in a same physical segment which is connected with SICOM6496 port 1/12.

In initial state, MAC address table do not learn any address mapping relationships. For example, PC1 and PC3 communicate with each other, the learning process of MAC address table is as follows:

1. When PC1 transmit information to PC3, switch receive the information source MAC address of 00-01-11-11-11-11 in port 1/5, the mapping relationships of MAC address 00-01-11-11-11-11 and port 1/5 will be added into switch MAC address table
2. Meanwhile, switch will find out the information destination MAC address (00-01-33-33-33-33), and the switch only have the mapping relationship of MAC address 00-01-11-11-11-11 and port 1/5, no have the corresponding port mapping of 00-01-33-33-33-33, so switch have to broadcast the information to all ports (suppose that switch all ports are in default VLAN)
3. PC3 and PC 4 in port 1/12 both receive the information from PC1, but PC4 is unable to respond to PC1 because its destination MAC address is 00-01-33-33-33-33; only PC3 will give response to PC1. Now port 1/12 receive the information sent from PC3, so the mapping relationship of MAC address 00-01-33-33-33-33 and port 1/12 will added in switch MAC address table
4. Now the mapping items in MAC address tables are: MAC address 00-01-11-11-11-11corresponds to port 1/5 and MAC address 00-01-33-33-33-33 corresponds to port 1/12.
5. After a period of communication between PC1 and PC3, switch do not receive information from PC1 and PC3, switch will delete the MAC address mapping relationships in MAC address table after 300 seconds which is the defaulted MAC address table aging time of SICOM6496. SICOM6496 supports aging time modification.

5.1.2 forwarding and filtering

when switch decides to forward or filter receiving data frames according to MAC address table. Take Figure 5-1 as example, suppose that SICOM6496 MAC address table dynamically learned the MAC addresses of PC1 and PC3, and manually configure mapping relationship of PC2 and PC4 with port. MAC address table of SICOM6496 is as follows

MAC address	Port number	Obtaining mode
00-01-11-11-11-11	1/5	dynamic
00-01-22-22-22-22	1/5	static
00-01-33-33-33-33	1/12	dynamic
00-01-44-44-44-44	1/12	static

1. forwarding situation according to MAC address table

If PC1 send information to PC3, switch forward data received in port 1/5 to port 1/12 according to MAC address table

2. Filtering situation according to MAC address table

If PC1 send information to PC2, switch find that PC2 and PC1 are in a same physical segment according to MAC address table, switch will filter the information, do not send the data frames.

Switch can forward three types of frames

- ✧ Broadcast frames
- ✧ Multicast frames
- ✧ Unicast frames

5.2 MAC address table configuration

5.2.1 mac-address-table aging-time

Command: **mac-address-table aging-time {*<age>*| 0}**

no mac-address-table aging-time

Function: setting the aging time for dynamic-learned address mapping relationships in MAC address table; no command is to restore the default aging time of 300 seconds

Parameter: ***<age>*** is aging time with the unit of second and a range of 10～100000. **0** means no aging.

Command mode: global configuration mode

Default: 300 seconds

User guide: if the aging time is set to short, unnecessary broadcast will be increased in switch to affect switch performance. If the aging time is too long, it make unused mapping items keep in MAC address table, so user should set e reasonable aging time according to actual situation.

When the aging time is "0", dynamic-learned address won't be filtered, and always reserved in MAC address tables.

Example: set the aging time to 400 seconds

SWITCH(Config)#mac-address-table aging-time 400

5.2.2 mac-address-table

Command: **mac-address-table {static|blackhole} address <*mac-addr*> vlan <*vlan-id* > interface <*interface-name*>**

no mac-address-table [static|blackhole|dynamic] [address <*mac-addr*>] [vlan <*vlan-id*>] [interface <*interface-name*>]

Function: add or modify static address items and filtering address items; no command is to delete static address items and filtering address items.

Parameters: **static** is static table items and **blackhole** means filtering table items. The purpose of filtering address items configuration is to drop designated MAC address frames to filter the unnessary flow, including filtering source address and destination address. **dynamic** is dynamic address table items; ***<mac-addr>*** means add or delete MAC address; ***<interface-name>*** is the name of port which forward MAC data packets; ***<vlan-id>*** is VLAN number

Command mode: global configuration mode

Default: after VLAN interface configuration and this VLAN interface is UP, system will create a static address mapping item of MAC address and VLAN number

User guide: for some special use or switch can't dynamically learn MAC address, user can use this command to manually establish mapping relationship of MAC address, port and VLAN.

Command **no mac-address-table** is to delete all dynamic, static and filtering MAC address mapping items in MAC address table, except the items reserved at default.

Example: establishing address mapping of port 1/1 belonging to VLAN200 to MAC address 00-03-0f-f0-00-18

SWITCH(Config)#mac-address-table static address 00-03-0f-f0-00-18 vlan 200 interface ethernet 1/1

5.3 typical configuration example

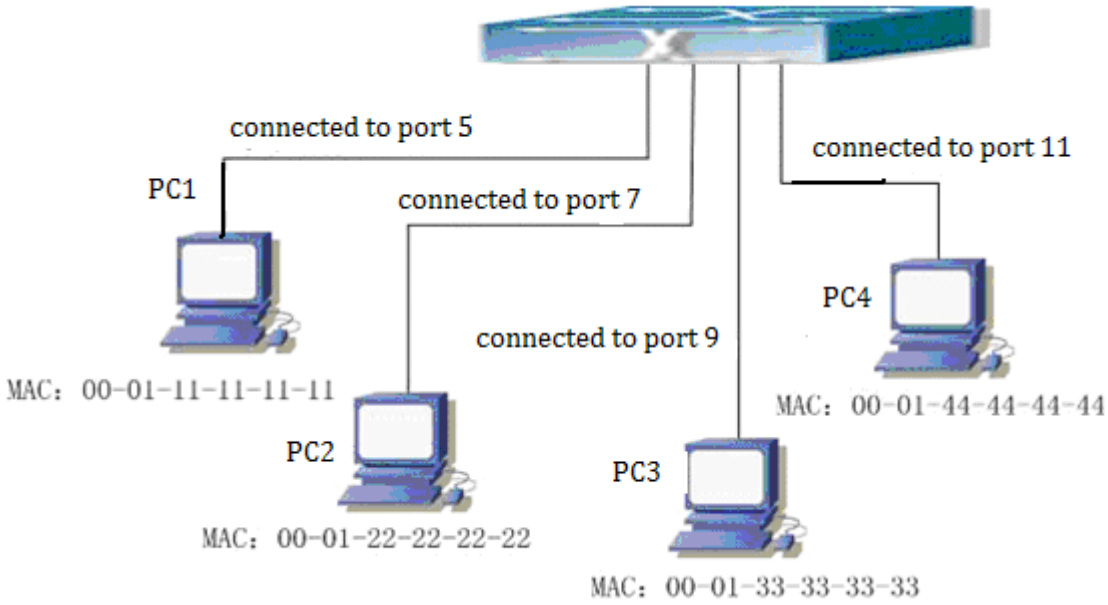


Figure 5-2 typical example of MAC address table

Example: as above figure, 4 PCs are respectively connected with port 1/5, 1/7, 1/11 in SICOM6496. These 4 PCs all belongs to defaulted VLAN1. According to the actual network requirements, dynamic learning function is enabled; PC1 preserve confidential materials and other PCs which are not in a same physical segment with PC1 are unable to access PC1. PC2 and PC3 respectively establish static mapping relationship with port 7 and port 9.

The configuration steps are as follows:

1, set the MAC address 00-01-11-11-11-11 of PC1 to be a filtering address

SWITCH(Config)#mac-address-table blackhole address 00-01-11-11-11-11 vlan 1 interface ethernet 1/1

1. PC2 and PC3 respectively establish static mapping relationship with port 7 and port 9

SWITCH(Config)#mac-address-table static address 00-01-22-22-22-22 vlan 1 interface ethernet 1/7

SWITCH(Config)#mac-address-table static address 00-01-33-33-33-33 vlan 1 interface ethernet 1/9

5.4 troubleshooting help

5.4.1 monitoring and debugging commands

5.4.1.1 show mac-address-table

Command: **show mac-address-table [static|aging-time|blackhole] [address <*mac-addr*>] [vlan <*vlan-id*>] [interface <*interface-name*>]**

Function: show current contents in switch MAC address table

Parameter: **static** is static table items, **aging-time** is address aging time, **blackhole** means filtering table items. ***<mac-addr>*** is to show MAC address included in items. ***<vlan-id>*** is to show VLAN number which are included in shown address items. ***<interface-name>*** is the port name which are included in the shown address items

Command mode: privilege user configuration mode

Default: no to show the contents of MAC address table

User guide: use this command to display MAC address items in category and use **show mac-address-table** command to display all MAC address items existing in switch.

Example: show present filtering address items in MAC address table

SWITCH#show mac-address-table blackhole

5.4.2 troubleshooting help

when we input command, if a port do not learn the MAC of devices which are connected with this port, the reasons might be:

- ☞ ethernet cables are broken, please change new one
- ☞ switch enable Spanning Tree and let port in discarding state. Or port just connect with device, Spanning Tree are still in calculation, wait until Spanning Tree calculation finished, port can start learning MAC address.
- ☞ If no caused by above reasons, please check if port is broken, or ask for technical sypport

Chapter 6 VLAN Configuration

6.1 VLAN Introduction

VLAN is virtual local area network. According to different requirements on functions, application, or management, it can logically divide the devices in LAN to different network segments to from different virtual working groups without the need of considering actual physical locations of devices. IEEE released IEEE802.1Q to specify standard VLAN's application solutions, so VLAN function of SICOM6496 also complies with IEEE802.1Q standard.

The technical feature of VLAN is that it can dynamically divide a big VLAN to many different broadcast domain according to requirements.

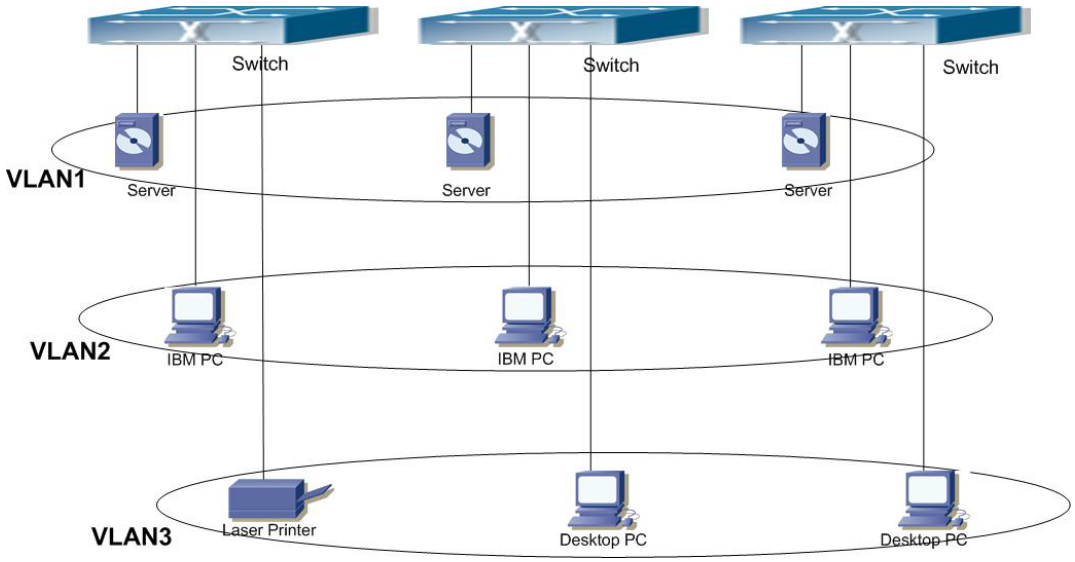


Figure 6-1: logically-defined VLAN network

Each broadcast domain is a VLAN. VLAN and physical LAN have same attributes, the only difference is that VLAN is a logical division, so the division of VLAN do not depend on physical locations, and broadcast, multicast and unicast flow in each VLAN is isolated to other VLAN.

Based on above features of VLAN, VLAN technology bring the convenience to us as follows:

- Improve network performance
- Save network resources
- Simplify network management
- Reduce network costs
- Increase network security

SICOM6496 supports VLAN defined by IEEE802.1Q and GVRP (GARP VLAN Registration Protocol), so this chapter will give you details in application and configuration of SICOM6496 VLAN and GVRP

6.2 VLAN configuration

6.2.1 task sequence of VLAN configuration

1. Create or delete VLAN
2. Specify or delete VLAN name
3. Distribute ports for VLAN
4. Configure switch port types
5. Set Trunk port
6. Set Access port

7. Enable or disable port VLAN entrance rules

1. Create or delete VLAN

Command	explanation
Global configuration mode	
vlan <*vlan-id*> **no vlan <*vlan-id*>**	Create/delete VLAN or enter VLAN mode

2. Specify or delete VLAN name

Command	explanation
VLAN configuration mode	
name <*vlan-name*> **no name**	Configure/delete VLAN name

3. Distribute ports for VLAN

Command	解释
VLAN configuration mode	
switchport interface <*interface-list*> **no switchport interface <*interface-list*>**	Distribute ports for VLAN

4. Set switch port types

Command	explanation
Interface configuration mode	
switchport mode {trunk|access}	Set present port to be Trunk or Access port

5. Set Trunk port

Command	explanation
Interface configuration mode	
switchport trunk allowed vlan {<*vlan-list*>|all} **no switchport trunk allowed vlan <*vlan-list*>**	Set/delete VLAN which is allowed to pass through Trunk port
switchport trunk native vlan <*vlan-id*> **no switchport trunk native vlan**	Set/delete PVID of Trunk port

6. Set Access port

Command	explanation
Interface configuration mode	
switchport access vlan <*vlan-id*> **no switchport access vlan**	Add/delete present port to specified VLAN

7. Enable or disable VLAN entry rules

Command	explanation
Global configuration mode	
vlan ingress enable **no vlan ingress enable**	Enable or disable VLAN entry rules

6.2.2 VLAN configuration mode

6.2.2.1 vlan

Command: **vlan <*vlan-id*>**

no vlan <*vlan-id*>

Function: create VLAN and enter VLAN configuration mode. In VLAN mode, user can configure VLAN name and distribute ports for VLAN; no command is to delete specified VLAN

Parameter: ***<vlan-id>*** is to create/delete VID of VLAN in a range of 1~4094

Command mode: global configuration mode

Default: there is only VLAN1

User guide: VLAN1 is default VLAN. User can not configure or delete VLAN1. Switch support max 4094 VLANs. Please be noted that dynamic VLAN learned by GVRP can't be deleted by this command

Example: create VLAN100 and enter VLAN100 configuration mode

SWITCH (Config)#vlan 100

SWITCH (Config-Vlan100)#

6.2.2.2 name

Command: **name <*vlan-name*>**

no name

Function: name specified VLAN. The name of VLAN is a descriptive string; no command is to delete VLAN name

Parameter: ***<vlan-name>*** is a sting of VLAN name

Command mode: VLAN configuration mode

Default: the name of default VLAN is vlanXXX. XXX is VID

User guide: switch provides the function of giving name to different specified VLANs, which is helpful for user to remember VLAN for easy management.

Example: VLAN100 named as TestVlan

SWITCH (Config-Vlan100)#name TestVlan

6.2.2.3 switchport access vlan

Command: **switchport access vlan <*vlan-id*>**

no switchport access vlan

Function: add present Accress port into specified VLAN; no command is to delete present port from VLAN

Parameter: ***<vlan-id>*** is vlan VID of the port which will be added into VLAN in a range of 1~4094

Command mode: interface configuration mode

Default: by default, app ports belong to VLAN1

User guide: only the ports which are in Access mode can be added to specified VLAN and Access ports should be added in a same VLAN

Example: add a Access port to VLAN100

SWITCH (Config)#interface ethernet 1/8

SWITCH (Config-ethernet1/8)#switchport mode access

SWITCH (Config-ethernet1/8)#switchport access vlan 100

SWITCH (Config-ethernet1/8)#exit

6.2.2.4 switchport interface

Command: **switchport interface <*interface-list*>**

no switchport interface <*interface-list*>

Function: this command is used to distribute ethernet ports for VLAN; no command is to delete a port or a group of ports from specified VLAN

Parameter: ***<interface-list>*** is a list of ports which are going to be added or deleted, supporting "," or "-", such as ethernet 1/1;2;5 or ethernet 1/1-6;8

Command mode: VLAN configuration mode

Default: new created VLAN do not contain any port

User guide: Access port is normal port which can be added to any VLAN, but only one VLAN.

Example: distribute ethernet port 1, 3, 4-7, 8 to VLAN100

SWITCH (Config-Vlan100)#switchport interface ethernet 1/1;3;4-7;8

6.2.2.5 switchport mode

Command: **switchport mode {trunk|access}**

Function: setting access mode or trunk mode for switch port

Parameter: **trunk** means port allow the flow of many VLANs; **access** means port only belongs to one VLAN.

Command mode: interface configuration mode

Default: access mode

User guide: the port working in trunk mode is called Trunk port. Trunk port allows flows of many VLANs. by the connection of Trunk port, same VLANs in different switches can communicate with each other. The port working in access mode is called Access port. Access ports can be distributed to a same VLAN.

Example: set port 5 working in trunk mode, and port 8 working in access mode

SWITCH (Config)#interface ethernet 1/5

SWITCH (Config-ethernet1/5)#switchport mode trunk

SWITCH (Config-ethernet1/5)#exit

SWITCH (Config)#interface ethernet 1/8

SWITCH (Config-ethernet1/8)#switchport mode access

SWITCH (Config-ethernet1/8)#exit

6.2.2.6 switchport trunk allowed vlan

Command: **switchport trunk allowed vlan {<*vlan-list*>|all}**

no switchport trunk allowed vlan

Function: setting trunk port allowed to pass through VLAN; no command is to restore the default situation

Parameter: ***<vlan-list>*** is a list of VLANs which are allowed to pass through this Trunk port; all means all VLAN flows are allowed to pass though this Trunk port

Command mode: interface configuration mode

Default: All VlANs are allowed to pass through Trunk port

User guide: user use this command to set which VLAN flow can pass though Trunk port. Those flow without VLAN will be forbidden

Example: setting the flow of VLAN1, 3, 5-20 allowed to pass through Trunk port

SWITCH (Config)#interface ethernet 1/5

SWITCH (Config-ethernet1/5)#switchport mode trunk

SWITCH (Config-ethernet1/5)#switchport trunk allowed vlan 1;3;5-20

SWITCH (Config-ethernet1/5)#exit

6.2.2.7 switchport trunk native vlan

Command; **switchport trunk native vlan <*vlan-id*>**

no switchport trunk native vlan

Function: set PVID of Trunk por; no command is to restore defaulted configuration

Parameter: **<*vlan-id*>** is PVID of Trunk port

Command mode: interface configuration mode

Default: the default PVID of Trunk port is 1

User guide: PVID is defined in IEEE802.1Q. The function of Trunk port PVID is that when a untagged frame enter Trunk port, the port will mark a native PVID tag mark on the untagged frame, which is used for VLAN forwarding

Example: set the native vlan of Trunk port to be 100

SWITCH (Config)#interface ethernet 1/5

SWITCH (Config-ethernet1/5)#switchport mode trunk

SWITCH (Config-ethernet1/5)#switchport trunk native vlan 100

SWITCH (Config-ethernet1/5)#exit

6.2.2.8 vlan ingress disable

Command: **vlan ingress disable**

no vlan ingress disable

Function: disable VLAN entry rules of port; no command is to enable entry rules

Command mode: interface configuration mode

Default: enable VLAN entry rules

User guide: when enable port VLAN entry rules, system will check if the source port is a member of VLAN when the system receiving data. If yes, system will receive data and forward them to destination port, otherwise, it will abandon the data.

Example: disable port VLAN entry rules

6.2.3 VLAN typical application

Example:

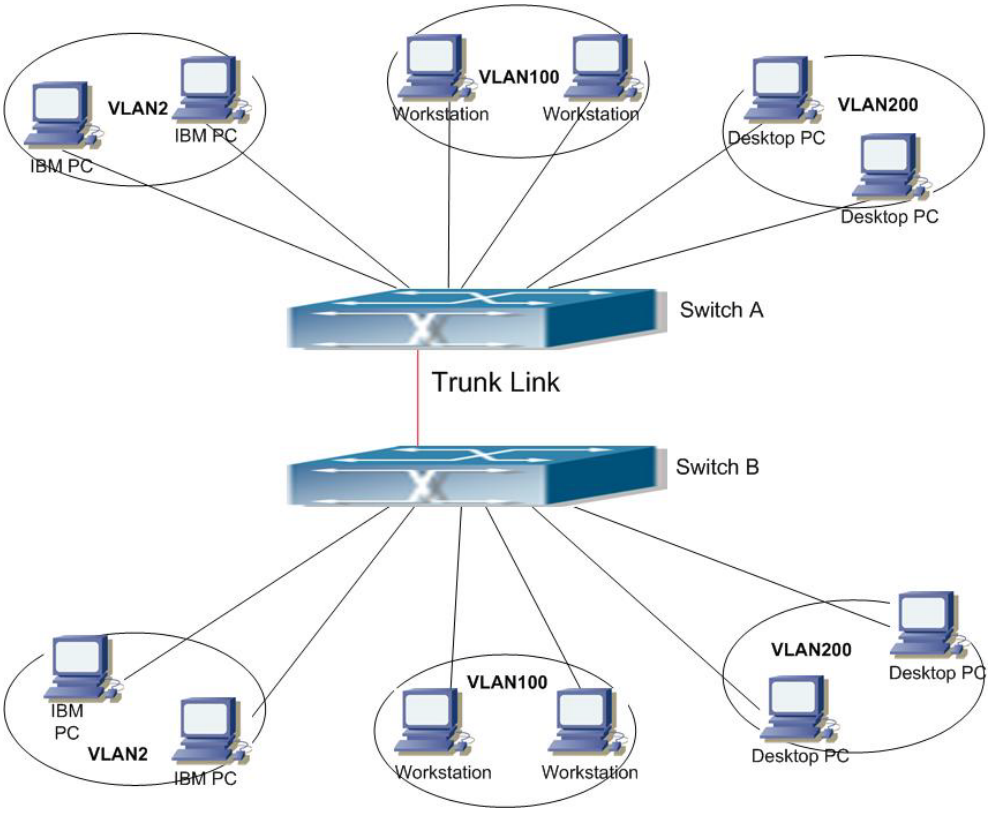


Figure 6-2: the topology of VLAN typical application

Based on the requirements of LAN security and application, the whole LAN need to be divided to 3 VLANs: VLAN2, VLAN100 and VLAN200, and these three VLANs cross two districts A and B. Now respectively put one switch in district A and B, so if VLAN flow can be transmitted in switches, so it can meet the district requirements.

Configuration items	Configuration explanation
VLAN2	Port 2~4 in switches in A and B
VLAN100	Port 5~7 in switches in A and B
VLAN200	Port 8~10 in switch in A and B
Trunk port	Port 11 in switches in A and B

Trunk port in two switches are connected to form Trunk Link, which is responsible for the VLAN flow of crossed switches. Connect various network devices with VLAN ports in switches, so they all belong to corresponding VLANs

In this example: port 1 and port 12 are unused which can be used as management ports or other applications

The configuration steps are as follows:

A switch:

SWITCH (Config)#vlan 2

SWITCH (Config-Vlan2)#switchport interface ethernet 1/2-4

SWITCH (Config-Vlan2)#exit

SWITCH (Config)#vlan 100

SWITCH (Config-Vlan100)#switchport interface ethernet 1/5-7

SWITCH (Config-Vlan100)#exit

SWITCH (Config)#vlan 200
SWITCH (Config-Vlan200)#switchport interface ethernet 1/8-10
SWITCH (Config-Vlan200)#exit
SWITCH (Config)#interface ethernet 1/11
SWITCH (Config-Ethernet1/11)#switchport mode trunk
SWITCH (Config-Ethernet1/11)#exit
SWITCH (Config)#
B switch:
SWITCH (Config)#vlan 2
SWITCH (Config-Vlan2)#switchport interface ethernet 1/2-4
SWITCH (Config-Vlan2)#exit
SWITCH (Config)#vlan 100
SWITCH (Config-Vlan100)#switchport interface ethernet 1/5-7
SWITCH (Config-Vlan100)#exit
SWITCH (Config)#vlan 200
SWITCH (Config-Vlan200)#switchport interface ethernet 1/8-10
SWITCH (Config-Vlan200)#exit
SWITCH (Config)#interface ethernet 1/11
SWITCH (Config-Ethernet1/11)#switchport mode trunk
SWITCH (Config-Ethernet1/11)#exit

6.3 GVRP Configuration

GARP is a short for Generic Attribute Registration protocol. GARP can dynamically distribute and broadcast the information of registering certain attribute between switch members in switching network. The attribute could be VLAN information, multicast MAC address or other information. Actually, GARP protocol is able to carry various attributes which need to be broadcasted by switch, and on the basis of GARP, it define various GARP applications which are called GARP application entities. GVRP is one of them.

GVRP is an abbreviation of GARP VLAN Registration Protocol. GVRP is an application based on GARP working mechanism. It is responsible for the maintenance of switch VLAN dynamic registration information, and broadcasting these registration information to other switches. A switch which supports GVRP can accept VLAN dynamic registration information from other switches, and update local VLAN registration information according to these information from other switches, meanwhile, switch can broadcast local VLAN registration information to other switches. VLAN registration information broadcasted by GVRP contains local static information by manual configuration, and dynamic information learned from other switches. In this way, VLAN information of GVRP-supported switches are unified through the broadcast of VLAN registration information.

6.3.1 task sequence of GVRP configuration

1. configure GARP timer parameters
2. enable GVRP function

4) Configure GARP timer parameters

Command	explanation
Interface configuration mode	

garp timer join <*timer-value*> **no garp timer join** **garp timer leave <*timer-value*>** **no garp timer leave** **garp timer hold <*timer-value*>** **no garp timer hold**	Configure hold, join and leave timers of GARP
Global configuration mode	
garp timer leave all <*timer-value*> **no garp timer leave all**	Configure leave all timer of GARP

5) Enable GVRP function

Command	explanation
Interface configuration mode	
gvrp **no gvrp**	Enable GVRP function at present port
Global configuration mode	
gvrp **no gvrp**	Enable switch GVRP function

6.3.2 GVRP command introduction

6.3.2.1 garp timer join

Command: **garp timer join <*timer-value*>**

no garp timer join

Function: configure GARP join timer values; no command is to restore to timer default value.

Parameter: ***<timer-value>*** is join timer value in a range of 100~327650ms

Command mode: interface configuration mode

Default: the default value of join timer is 200ms

User guide: When join timer has timed out, GARP application entity will transmit join information to other GARP application entities. After receiving join information, other GARP application entities will register this information.

Example: set GARP join timer of port 10 to 1000ms

SWITCH (Config-Ethernet1/10)#garp timer join 1000

6.3.2.2 garp timer leave

Command: **garp timer leave <*timer-value*>**

no garp timer leave

Function: configure GARP leave timer values; no command is to restore to timer default value.

Parameter: ***<timer-value>*** is leave timer value in a range of 100~327650ms

Command mode: interface configuration mode

Default: the default value of leave timer is 600ms

User guide: when GARP application entity wish to delete certain registration information, it will transmit leave information. The GARP application entity which receive the leave information will enable leave timer, and if it do not receive join information before timeout of leave timer, it will delete this registration information. Moreover, the leave timer value must be double the join timer value, otherwise, error occurs.

Example: set GARP leave timer of port 1/10 to 3000ms
SWITCH (Config-Ethernet1/10)#garp timer leave 3000

6.3.2.3 garp timer hold

Command: **garp timer hold <*timer-value*>**

no garp timer hold

Function: configure GARP hold timer values; no command is to restore to timer default value.
Parameter: **<*timer-value*>** is GARP hold timer value in a range of 100~327650ms
Command mode: interface configuration mode
Default: the default value of hold timer is 100ms
User guide: when GARP application entity receive join information, it won't transmit join information to others immediately, but enable hold timer. When hold timer has timed out, it will send all join information received within hold time in a GVRP frame, which is to effectively reduce protocol information flow.

6.3.2.4 garp timer leaveall

Command: **garp timer leaveall <*timer-value*>**

no garp timer leaveall

Function: configure GARP leaveall timer values; no command is to restore to timer default value.
Parameter: **<*timer-value*>** is GARP leaveall timer value in a range of 100~327650ms
Command mode: global configuration mode
Default: the default value of leaveall timer is 10000ms
User guide: after enable GARP application entity, enable leaveall timer at the same time. When leavell timer has timed out, GARP application entity will transmit leaveall information to others, then other entities will delete all attributes information of this entity, and meanwhile leaveall timer will be returned to zero and start a new cycle.
Example: set the switch GARP leaveall timer value to 50000ms
SWITCH (Config)#garp timer leaveall 50000

6.3.2.5 gvrp

Command: **gvrp**

no gvrp

Function: enable GVRP function of switch or present port; no command is to disable global or port GVRP function
Command mode: interface configuration mode and global configuration mode
Default: GVRP function is disabled
User guide: after global GVRP function is enabled, port GVRP function is able to be enabled. If global GVRP function is disabled, port GVRP configuration becomes invalid. Please be noted that only Trunk port supports GVRP function
Example: enable global and Trunk port10's GVRP function
SWITCH (Config)#gvrp
SWITCH (Config)#interface ethernet 1/10
SWITCH (Config-Ethernet1/10)#gvrp
SWITCH (Config)#exit

6.3.3 GVRP typical application

Example:

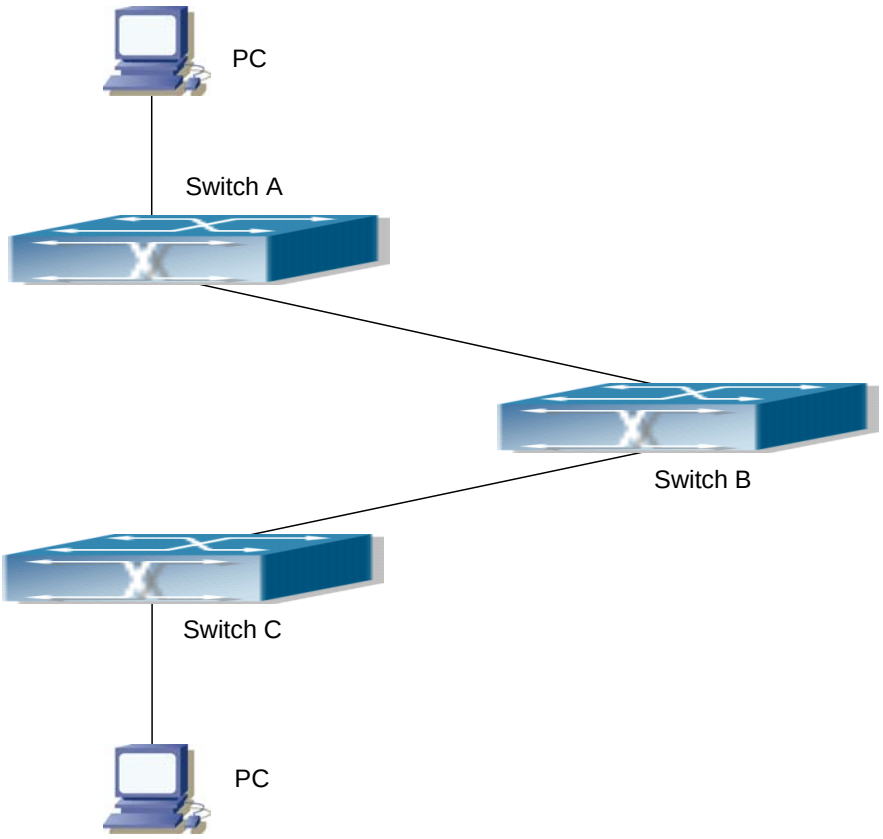


Figure 6-3: GVRP typical application topology

In order to achieve VLAN information dynamic registration and update between switches, GVRP protocol need to be configured in switch. Configure GVRP in switch A, B and C to make switch B learn dynamic VLAN100. In this way, two working stations which are respectively connected to VLAN100 of switch A and C can communicate with each other through switch B which do not configure static VLAN100.

Configuration items	Configuration explanation
VLAN100	Port 2-6 in switch A and C
Trunk port	Port 11 in switch A and C, port 10 and 11 in switch B
Global GVRP	Switch A, B and C
Port GVRP	Port 11 in switch A and C, port 11 in switch B

Two working stations are respectively connected to VLAN100 ports in switch A and B; port 11 in switch A connect with port 10 in switch B; 11 port in switch B connect with port 11 in switch C.

Configuration steps are as follows:

Switch A:

SWITCH (Config)#gvrp

SWITCH (Config)#vlan 100

SWITCH (Config-Vlan100)#switchport interface ethernet 1/2-6

SWITCH (Config-Vlan100)#exit

SWITCH (Config)#interface Ethernet 1/11

SWITCH (Config-Ethernet1/11)#switchport mode trunk

SWITCH (Config-Ethernet1/11)#gvrp

SWITCH (Config-Ethernet1/11)#exit

Switch B:
SWITCH (Config)#gvrp
SWITCH (Config)#interface ethernet 1/10
SWITCH (Config-Ethernet1/10)#switchport mode trunk
SWITCH (Config-Ethernet1/10)#gvrp
SWITCH (Config-Ethernet1/10)#exit
SWITCH (Config)#interface ethernet 1/11
SWITCH (Config-Ethernet1/11)#switchport mode trunk
SWITCH (Config-Ethernet1/11)#gvrp
SWITCH (Config-Ethernet1/11)#exit

Switch C:
SWITCH (Config)#gvrp
SWITCH (Config)#vlan 100
SWITCH (Config-Vlan100)#switchport interface ethernet 1/2-6
SWITCH (Config-Vlan100)#exit
SWITCH (Config)#interface ethernet 1/11
SWITCH (Config-Ethernet1/11)#switchport mode trunk
SWITCH (Config-Ethernet1/11)#gvrp
SWITCH (Config-Ethernet1/11)#exit

6.4 VLAN troubleshooting help

6.4.1 monitoring and debugging information

6.4.1.1 show vlan

Command: **show vlan [brief| summary] [id <*vlan-id*>] [name <vlan-name>]**

Function: show detail status information of all VLAN or specified VLAN

Parameter: **brief** means brief information; ***<summary>*** show VLAN statistic information; ***<vlan-id>*** is VLAN ID of VLAN which is specified to show its status information in a range of 1~4094; ***<vlan-name>*** is the name of VLAN which is specified to show its status information with a length of 1~11.

Command mode: privilege user configuration mode

User guide: if ***<vlan-id>*** or***<vlan-name>*** is not indicated, it means showing all VLAN status information

Example: showing current VLAN status information; showing current VLAN statistic information.

SWITCH#show vlan

VLAN	Name	Type	Status	Ports
1	default	Static	Active	Ethernet1/1 Ethernet1/2
				Ethernet1/3 Ethernet1/4
				Ethernet1/9 Ethernet1/10
				Ethernet1/11 Ethernet1/12
2	VLAN0002	Static	Active	Ethernet1/5 Ethernet1/6
				Ethernet1/7 Ethernet1/8

VLAN Type MTU
-------- -------- --------
1 ENET 1500
2 ENET 1500

SWITCH#sh vlan summary
Existing Vlans:
1 2
Number of Existing Vlans is:2

Showing contents	explanation
VLAN	VLAN number
Name	VLAN name
Type (first one)	VLAN attribute (static configuration or dynamic learning)
Status	VLAN status: active
Ports	Access port in VLAN
Type (second one)	Type of VLAN interface: ethernet
MTU	Maximum transmission unit is 1500 bytes

6.4.1.2 show garp

Command: **show garp [*<interface-name>*]**

Function: show GARP global and port information

Parameter: ***<interface-name>*** is the name of Trunk port which is specified to show

Command mode: privilege user configuration mode

User guide: none

Example: show global GARP information

SWITCH#show garp

6.4.1.3 show gvrp

Command: **show gvrp [*<interface-name>*]**

Function: show GVRP global and port information

Parameter: ***<interface-name>*** is the name of Trunk port which is specified to show

Command mode: privilege user configuration mode

User guide: none

Example: show global GVRP information

SWITCH#show gvrp

---------- Gvrp Infomation ----------

Gvrp status : enable

Gvrp Timers(milliseconds)

LeaveAll : 10000

6.4.1.4 debug gvrp

Command: **debug gvrp**

no debug gvrp

Function: turn on switch gvrp debugging switch; no command is to turn off debugging switch

Command mode: privilege user configuration mode

Default: turn off switch gvrp debugging switch

User guide: this command is used to turn on gvrp debugging switch to show information of switch processing gvrp data packets

Example: turn on gvrp debugging switch

SWITCH#debug gvrp

6.4.2 VLAN troubleshooting help

- ☞ The configuration of Trunk port GARP calculators at two sides of Trunk links must be the same, otherwise GVRP can't work normally.
- ☞ SICOM6496 GVRP function and RSTP can't be enabled at the same time. If enable GVRP function, please disable port RSTP function first.

6.5 WEB Management

Click Device basic configuration→VLAN configuration to manage switch VLAN configuration

6.5.1 VLAN configuration

Click device basic configuration→VLAN configuration→VLAN configuration to open the submenu and user can manage switch VLAN tables

6.5.1.1 Create or Remove VLAN

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Create/Remove VLAN to add or delete VLAN in switch

6.5.1.1.1 VID allocation

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Create/Remove VLAN→VID Allocation to create or delete VLAN, which is equivalent to CLI command in chapter 6.2.2.1

- ☞ VID- specified VLAN ID

Set VID to 100, click "Add" to create a new VLAN100.

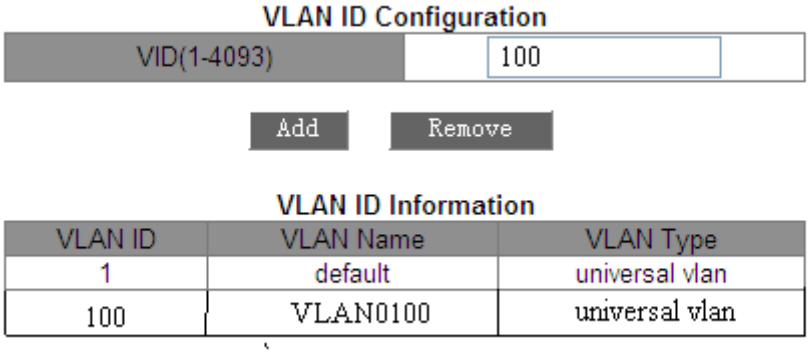


Figure 6-4 switch VLAN ID management

6.5.1.1.2 VID Attribution Configuration

Click Device Basic Configuration→VLAN configuration→VLAN configuration→Create/Remove VLAN→VID Attribution Configuration to set VLAN attributes

- ☞ VLAN ID-- specified VLAN ID
- ☞ VLAN name- configure VLAN name which is equivalent to CLI command in chapter 6.2.2.2
- ☞ VLAN type

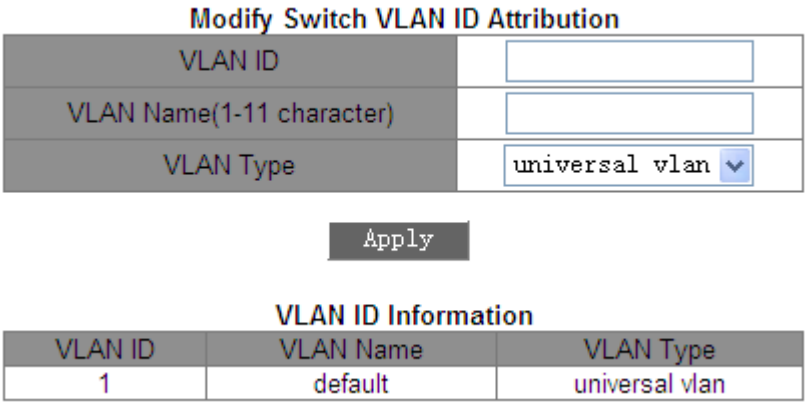


Figure 6-5: switch VLAN name modification

6.5.1.2 Allocates port for VLAN

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Allocate Ports for VLAN to configure port VLAN

6.5.1.2.1 Allocate ports for VLAN

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Allocate Ports for VLAN→Allocate Ports for VLAN to allocate Ethernet ports for VLAN, which is equivalent to CLI command in chapter 6.2.2.4

Select 1 in VLAN ID and Ethernet3/1 in Ethernet port, click "Apply" to add port Ethernet3/1 to VLAN1.

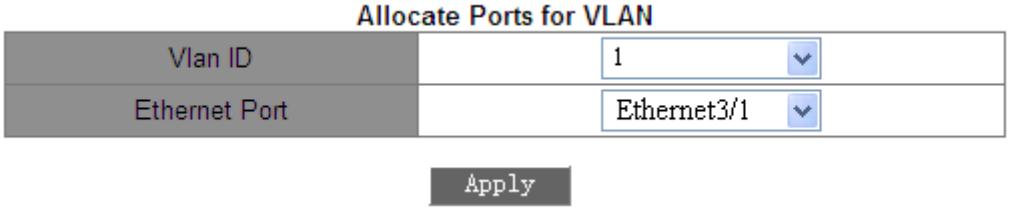


Figure 6-5: port distribution for VLAN

6.5.1.3 Port Type Configuration

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Port Type Configuration. User can do port type configuration.

6.5.1.3.1 Set port mode (Trunk/Access)

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Port Type Configuration→Set Port Mode (Trunk/Access) to set switch port mode

- Port- - specified port
- Type-- access mode, trunk mode, which is equivalent to CLI command in chapter 6.2.2.5

Select Ethernet1/1 in port, and select Trunk in mode, select Enable Vlan Ingress rules, click "Apply" to finish configuration

Port Mode Configuration

Port	Type
Ethernet1/1	access

Apply

Port Mode Configuration

Port	Type
Ethernet1/1	access
Ethernet1/2	access
Ethernet1/3	access
Ethernet1/4	access
Ethernet1/5	access
Ethernet1/6	access
Ethernet1/7	access
Ethernet1/8	access
Ethernet2/1	access
Ethernet2/2	access
Ethernet2/3	access
Ethernet2/4	access
Ethernet2/5	access
Ethernet2/6	access
Ethernet2/7	access
Ethernet2/8	access
Ethernet3/5	access
Ethernet3/6	access

Figure 6-7 Port type distribution

6.5.1.4 Trunk port configuration

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Trunk Port configuration.User can configure TRUNK port

6.5.1.4.1 Trunk port VLAN configuration

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Trunk Port configuration→VLAN Setting for Trunk Port

- trunk native vlan-- setting port native vlan, which is equivalent to CLI command in chapter 6.2.2.7
- trunk port-- port list
- Trunk allow VLAN list

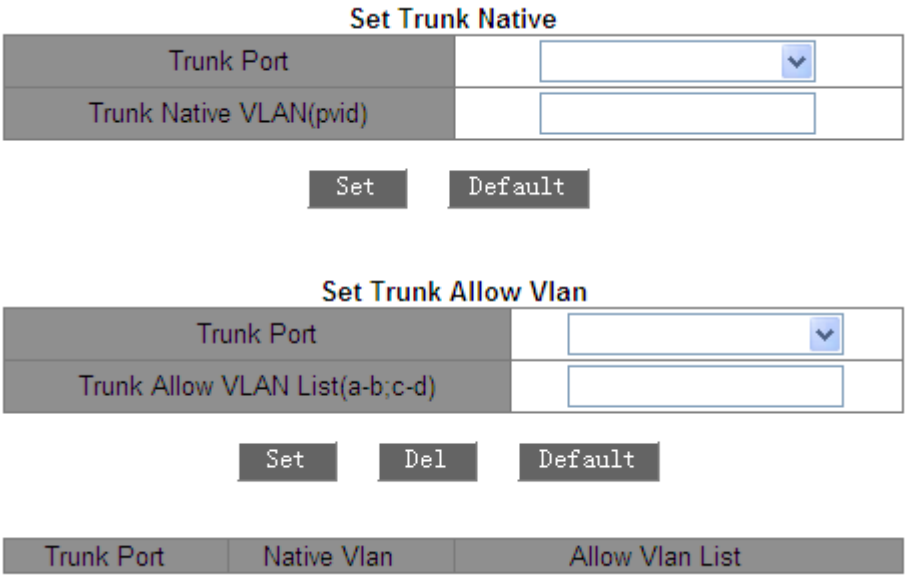


Figure 6-8 Trunk port VLAN configuration

6.5.1.5 Enable or Disable VLAN Ingress Rule

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Enable/Disable VLAN Ingress Rule.User can configure VLAN filtering function

6.5.1.5.1 Enable or Disable VLAN Ingress Rule

Click Device Basic Configuration→VLAN Configuration→VLAN Configuration→Enable/Disable VLAN Ingress Rule→Enable/Disable VLAN Ingress Rule to enable or disable VLAN ingress rules

☞ It is equivalent to CLI command in chapter 6.2.2.8

Select port Ethernet1/1, click “close” to close VLAN ingress rules of port 1/1; select “open” to open VLAN ingress rules

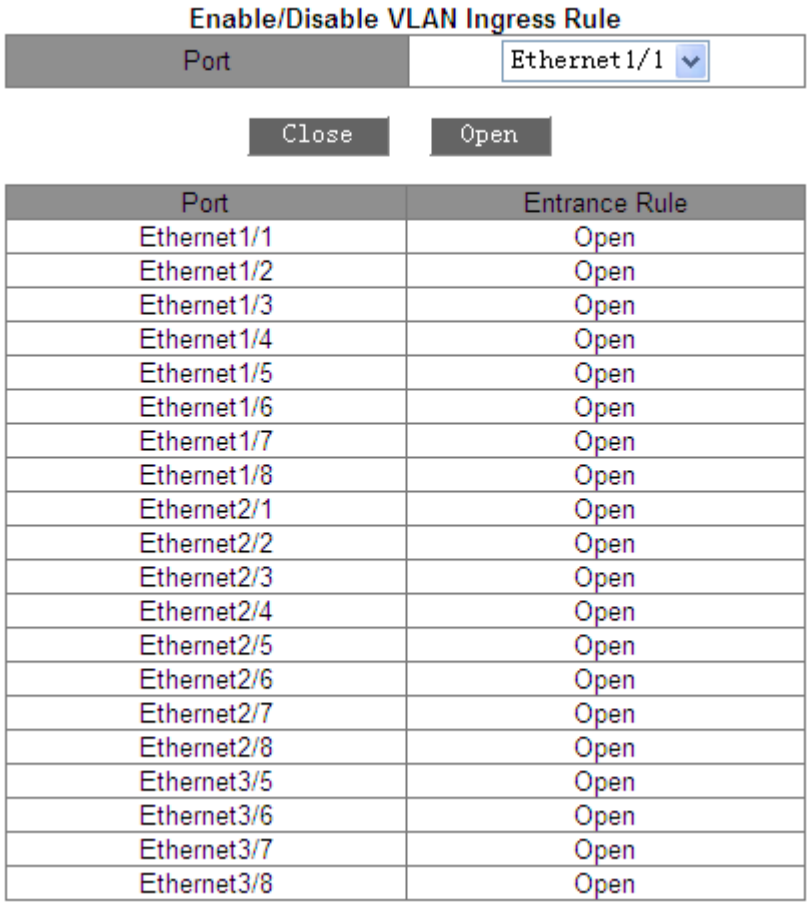


Figure 6-9 enable or disable VLAN entry rules

6.5.2 GVRP Configuration

Click Device Basic Configuration→VLAN configuration→GVRP Configuration to configure and manage GVRP function

6.5.2.1 Enable global GVRP

Click Device Basic Configuration→VLAN configuration→GVRP Configuration→Enable Global GVRP to enable or disable global GVRP function, which is equivalent to CLI command in chapter 6.3.2.5

Select "Enable GVRP" , click "Apply" to complete configuration

Figure 6-10 enable global GVRP

6.5.2.2 Enable port GVRP

Click Device Basic Configuration→VLAN configuration→GVRP Configuration→Enable Port GVRP to enable or disable port GVRP function, which is equivalent to CLI command in chapter 6.3.2.5

Select port "Ethernet3/1" and select "enable GVRP", click "Apply" to enable GVRP function of port 3/1. Please be noted that only Trunk port can set GVRP function.

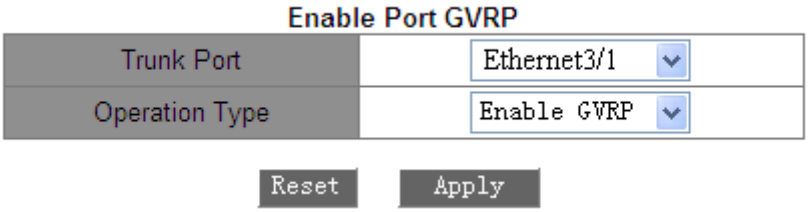


Figure 6-11 enable port GVRP

6.5.2.3 GVRP configuration

Click Device Basic Configuration→VLAN configuration→GVRP Configuration→GVRP configuration to configure switch GVRP parameters

- Port-- specified port
- Join timer (100~327650ms)-- configure GVRP join timer value, which is equivalent to CLI command in chapter6.3.2.1
- Leave timer (100~327650ms)-- configure GVRP leave timer value, which is equivalent to CLI command in chapter6.3.2.2
- Hold timer (100~327650ms)-- configure GVRP hold timer value, which is equivalent to CLI command in chapter6.3.2.3
- Leaveall timer (100~327650ms)-- configure GVRP leaver timer value, which is equivalent to CLI command in chapter6.3.2.4

Select port "Ethernet3/1", set the values: 200 in Join timer, 600 in Leave timer, 100 in Hold timer, 10000 in leaveall timer, click "Apply" to complete configuration

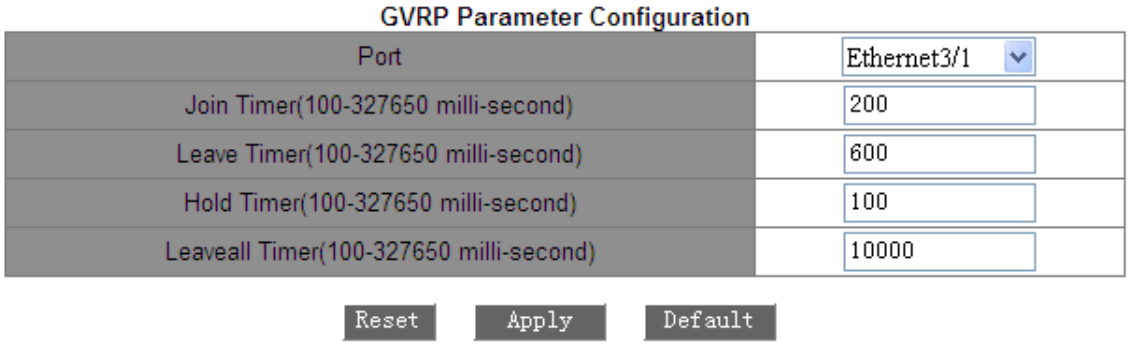


Figure 6-12 GVRP configuration

6.5.3 VLAN Debug and Maintenance

Click Device Basic Configuration→VLAN configuration→VLAN Debug and Maintenance to show VLAN related configuration information

6.5.3.1 show VLAN

Click Device Basic Configuration→VLAN configuration→VLAN Debug and Maintenance→Show VLAN i, which is equivalent to CLI command in chapter 6.4.1.1

VLAN ID	Name	Type	Media	PORTs
1	default	Static	ENET	Ethernet3/1(T) Ethernet3/2 Ethernet3/3 Ethernet3/4 Ethernet3/5 Ethernet3/6 Ethernet3/7 Ethernet3/8
2	VLAN0002	Static	ENET	Ethernet3/1(T)
3	VLAN0003	Static	ENET	Ethernet3/1(T)

Figure 6-13 show VLAN

6.5.3.2 Show GARP

Click Device Basic Configuration→VLAN configuration→VLAN Debug and Maintenance→Show GARP, which is equivalent to CLI command in chapter 6.4.1.2

Information Display

```
---------------- Garp Infomation ------------------
Garp Application status : Gvrp is enable
Garp Timers(milliseconds)
LeaveAll     :  10000

Port Ethernet3/1 Garp Timers(milliseconds)
Hold         :    100
Join         :    200
Leave        :    600
```

Figure 6-14 show GARP information

6.5.3.3 Show GVRP

Click Device Basic Configuration→VLAN configuration→VLAN Debug and Maintenance→Show GVRP, which is equivalent to CLI command in chapter 6.4.1.3

Information Display

```
---------------- Gvrp Infomation ------------------
Gvrp status : enable
Gvrp Timers(milliseconds)
LeaveAll     :  10000

Port Ethernet3/1 status      : Gvrp Enable
                             : Registration normal
Port Gvrp Timers(milliseconds)
Hold         :    100
Join         :    200
Leave        :    600
```

Figure 6-15 show GVRP information

Chapter 7 IGMP Snooping Configuration

7.1 IGMP Snooping Introduction

IGMP is a short for Internet Group Management Protocol for IP multicast. Network devices which support multicast (e.g. router) use IGMP to operate host membership query and hosts which want to join a multicast group use IGMP to inform router to receive data packets from the multicast address. These are accomplished by IGMP message switching. First, router use a group address (e.g. 224.0.0.1) which is able to address all hosts to send a message of IGMP host membership query. If a host wish to join a multicast group, it will use the group address of the multicast group to reply a message of IGMP host membership report.

IGMP Snooping is to limit multicast overflow, only forward multicast flow to the ports which are connected with multicast devices. Switch snoops IGMP messages between multicast router and hosts , maintain multicast forwarding table according to snooping results, and decide the forwarding of multicast packets according to multicast forwarding table.

SICOM6496 supports IGMP Snooping function, and provides sending Query function, so user can use SICOM6496 to achieve IP multicast.

7.2 IGMP Snooping Configuration

7.2.1 Task Sequence of IGMP Snooping Configuration

1. Enable IGMP Snooping function
2. Configure IGMP Snooping
3. Send IGMP Query

1. Enable IGMP Snooping function

Command	explanation
Global configuration mode	
ip igmp snooping **no ip igmp snooping**	Enable IGMP Snooping function

2. Configure IGMP Snooping

command	explanation
Global configuration mode	
ip igmp snooping vlan *<vlan-id>* **no ip igmp snooping vlan *<vlan-id>***	Enable IGMP Snooping function of specified VLAN

3. Configure IGMP to send Query

Command	explanation
Global configuration mode	
ip igmp snooping vlan *<vlan-id>* query **no ip igmp snooping vlan *<vlan-id>* query**	Enable IGMP Snooping Query function of specified VLAN
ip igmp snooping vlan *<vlan-id>* query robustness *<robustness-variable>* **no ip igmp snooping vlan *<vlan-id>* query robustness**	Setting robust parameters of IGMP Snooping Query function in specified VLAN
ip igmp snooping vlan *<vlan-id>* query interval *<interval-value>* **no ip igmp snooping vlan *<vlan-id>* query**	Setting sending interval of IGMP Snooping Query function in specified VLAN

interval	
ip igmp snooping vlan *<vlan-id>* query max-response-time *<time-value>* **no ip igmp snooping vlan *<vlan-id>* query max-response-time**	Setting max response time of IGMP Snooping Query function in specified VLAN

7.2.2 IGMP Snooping Configuration Command

7.2.2.1 ip igmp snooping

Command: **ip igmp snooping**

no ip igmp snooping

Function: enable switch IGMP Snooping function; no command is to disable IGMP Snooping

Command mode: global configuration mode

Default: disable IGMP Snooping

User guide: enable switch IGMP Snooping function to make witch monitor multicast flow in network and decide which ports can receive multicast flow.

Example: enable IGMP Snooping in global mode

SWITCH (Config)#ip igmp snooping

7.2.2.2 ip igmp snooping vlan

Command: **ip igmp snooping vlan *<vlan-id>***

no ip igmp snooping vlan *<vlan-id>*

Function: enable ICMP Snooping function in specified VLAN; no command is to disable IGMP Snooping function in specified VLAN

Parameter: ***<vlan-id>*** is VLAN number

Command mode: global configuration mode

Default: disable IGMP Snooping

User guide: switch IGMP Snooping function is enabled before enable IGMP Snooping function of specified VLAN. This command and command **ip igmp snooping vlan *<vlan-id>* query** are mutually exclusive, that means only one of functions (Snooping or Query) is supported in a VLAN.

Example: enable IGMP Snooping function of VLAN100 in global configuration mode

SWITCH (Config)#ip igmp snooping vlan 100

7.2.2.3 ip igmp snooping vlan mrouter

Command: **ip igmp snooping vlan *<vlan-id>* mrouter interface *<interface –name>***

no ip igmp snooping vlan *<vlan-id>* mrouter

Function: configure static multicast router port in specified VLAN. This command is to delete multicast router port

Parameter: ***<vlan-id>*** is specified VLAN number; ***<interface –name>*** is specified multicast router port number

Command mode: global configuration mode

Default: there is not M-Router port

User guide: at present, switch do not support static multicast router port configuration function, but support dynamic multicast router port learning function

7.2.2.4 ip igmp snooping vlan static

Command: **ip igmp snooping vlan *<vlan-id>* static *<multicast-addr>* interface *<interface –name>***

no ip igmp snooping vlan *<vlan-id>* static *<multicast-addr>*

Function: setting IGMP Snooping static multicast group member; no command is to delete the function.

Parameter: ***<vlan-id>*** specifies VLAN number; ***<multicast-addr>*** is multicast group address; ***<interface-name>*** is multicast group member port

Command mode: global configuration mode

Default: there is not static multicast group

User guide: if static multicast address exists in the group, and it is a dynamic address, so the static address will cover dynamic address.

Example: create a static multicast address 224.1.1.1in VLAN100 and add port 1/6 to this group

SWITCH (Config)#ip igmp snooping vlan 100 static 224.1.1.1 interface eth 1/6

Delete static multicast address 224.1.1.1 from VLAN100

SWITCH (Config)#no ip igmp snooping vlan 100 static 224.1.1.1

7.2.2.5 ip igmp snooping vlan query

Command: **ip igmp snooping vlan *<vlan-id>* query**

no ip igmp snooping vlan *<vlan-id>* query

Function: enable IGMP Query function of specified VLAN; no command is to disable Query function

Parameter: ***<vlan-id>*** is specified VLAN number

Command mode: global configuration mode

Default: disable IGMP Query function

User guide: the premises of enabling IGMP Query function in specified VLAN are that there is corresponding VLAN in switch and switch IGMP Snooping is enabled. Please be noted that this command and command **ip igmp snooping vlan *<vlan-id>*** are mutually exclusive, that means, only one of functions (Snooping or Query) is supported in a VLAN.

Example: enable IGMP Query function in VLAN100

SWITCH (Config)#ip igmp snooping vlan 100 query

7.2.2.6 ip igmp snooping vlan query robustness

Command: **ip igmp snooping vlan *<vlan-id>* query robustness *<robustness-variable>***

no ip igmp snooping vlan *<vlan-id>* query robustness

Function: set robust parameters of IGMP Query function in specified VLAN; no command is to restore default value

Parameter: ***<vlan-id>*** is specified VLAN number; ***<robustness-variable>*** is robust parameter in a range of 2~10.

Command mode: global configuration mode

Default: default value of robust parameter is 2

User guide: if the bigger the parameter is, the worse the network environment is. The less, the better. User can set a proper robust parameter according to actual network.

Example: set the robust parameter of VLAN100 IGMP Query to 3

SWITCH (Config)#ip igmp snooping vlan 100 query robustness 3

7.2.2.7 ip igmp snooping vlan query interval

Command: **ip igmp snooping vlan *<vlan-id>* query interval *<interval-value>***

no ip igmp snooping vlan *<vlan-id>* query interval

Function: set the interval of sending IGMP Query in specified VLAN; no command is to restore default value

Parameter: ***<vlan-id>*** is specified VLAN number; ***<interval-value>*** is the interval of sending Query

in a range of 1~65535
Command mode: global configuration mode
Default: the default interval of sending Query is 125s
Example: set the interval of sending IGMP Query in VLAN100 to 60s
SWITCH (Config)#ip igmp snooping vlan 100 query interval 60

7.2.2.8 ip igmp snooping vlan query max-response-time

Command: **ip igmp snooping vlan *<vlan-id>* query max-response-time *<time-value>***
no ip igmp snooping vlan *<vlan-id>* query max-response-time
Function: set the max response time of IGMP Query in specified VLAN; no command is to restore default value
Parameter: ***<vlan-id>*** is specified VLAN number, ***<time-value>*** is specified max Query response time in a range of 10~25.
Command mode: global configuration mode
Default: the max Query response time is 10s
Example: configure the IGMP max Query response time to 12s in VLAN100
SWITCH (Config)#ip igmp snooping vlan 100 query max-response-time 12

7.2.2.9 ip igmp snooping dlf-drop

Command: **ip igmp snooping dlf-drop**
no ip igmp snooping dlf-drop
Function: set up dropping unknown multicast messages; no command is to restore default value, that means doing broadcast
Parameter: none
Command mode: global configuration mode
Default: broadcast received unknown multicast messages
Example: configure switch to drop received unknown multicast messages
SWITCH (Config)# ip igmp snooping dlf-drop

7.2.2.10 ip igmp snooping vlan address

Command: **ip igmp snooping vlan *<vlan-id>* address *< A.B.C.D >***
no ip igmp snooping vlan *<vlan-id>* address
Function: set the IP address of VLAN which is specified by IGMP Snooping. If query function is enabled, this address will be the IP address of querier; no command is to restore default values
Parameter: ***<vlan-id>*** is specified VLAN number; ***< A.B.C.D >*** is specified IP address
Command mode: global configuration mode
Default: the default IP address is 192.168.0.2.
Example: set VLAN100 IP address to 192.168.100.100.
SWITCH (Config)# ip igmp snooping vlan 100 address 192.168.100.100

7.3 IGMP Snooping Example

Example 1: IGMP Snooping function

Figure 7-1: enable switch IGMP Snooping function

As shown in above figure, switch VLAN100 contains port 1, 2, 6, 10, 12. 4 PCs respectively connected with port 2, 6, 10, 12. Multicast router is connected with port 1. It is supposed that we need to enable IGMP Snooping in VLAN100. But at default, switch global IGMP Snooping function and VLAN IGMP Snooping function are unable to be enabled, so now we need to enable global IGMP Snooping function and IGMP Snooping in VLAN100.

Configuration steps are as follows:

SWITCH#config

SWITCH (config)#ip igmp snooping

SWITCH (config)#ip igmp snooping vlan 100

Multicast configruaiton:

We suppose that server provides two programs which respectively use group addresses of Group1 and Group2. 4 PCs operate multicast application software at the same time. 3 PCs which respectively connected with port 2, 6 and 10 play program 1, PC connected with port 12 plays program 2.

The results of IGMP Snooping:

Multicast table created in VLAN100 IGMP Snooping that port 1, 2 and 6 are in Group1; port 1, 12 are in Group2

4 PCs can normally receive the program they are interested in; port 2,6 and 10 won't receive the flow of program 2; port 12 won't receive the flow of program 1.

Example 2:

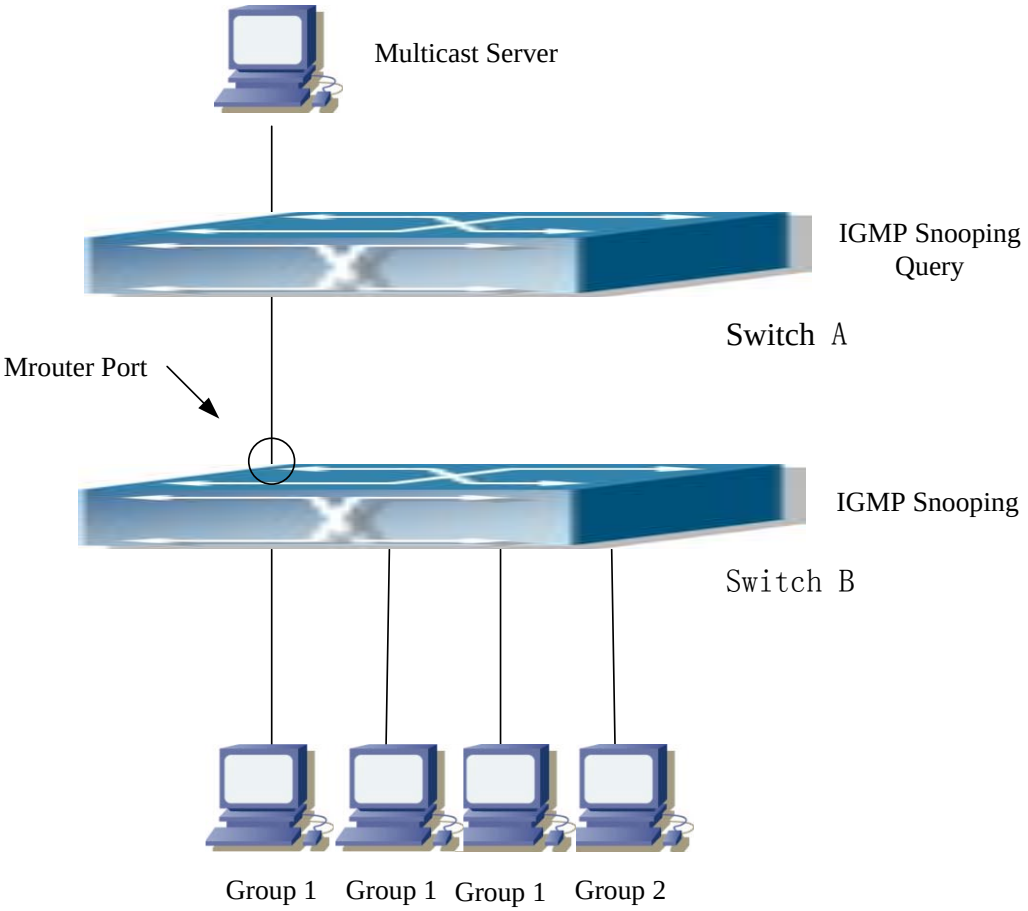


Figure 7-2: switch working as IGMP Querier

Set port 1, 2, 6, 10 ,12 in Switch B VLAN100. 4 PCs respectively connect with port 2, 6, 10 ,12; port 1 is connected with SwitchA. SwitchA serve as multicast router, set port 1,2 in VLAN100. Port I connect with multicast server, port 2 connect with SwitchB. In order to transmit Query regularly, SwitchA need to enable global IGMP Snooping function, and enable IGMP Snooping Query in VLAN100 at the same time. In SwitchB, global IGMP Snooping need to be enabled and meanwhile enable IGMP Snooping in VLAN100.

Configuration steps are as follows:

SwitchA#config

SwitchA(config)#ip igmp snooping

SwitchA(config)#ip igmp snooping vlan 100 query

SwitchB#config

SwitchB(config)#ip igmp snooping

SwitchB(config)#ip igmp snooping vlan 100

Multicast configuration:

We suppose that multicast server provides two programs which respectively use group addresses of Group1 and Group2. 4 PCs operate multicast application software at the same time. 3 PCs which respectively connected with SwitchB port 2, 6 and 10 play program 1, PC connected with SwitchB

port 12 plays program 2.

The results of IGMP Snooping:

Multicast table created in SwitchB VLAN100 IGMP Snooping that port 1, 2, 6 and 10 are in Group1; port 1, 12 are in Group2

4 PCs can normally receive the program they are interested in; SwitchB port 2, 6 and 10 won't receive the flow of program 2; port 12 won't receive the flow of program 1.

7.4 IGMP Snooping troubleshooting help

7.4.1monitoring and debugging commands

7.4.1.1 show ip igmp snooping

Command: **show ip igmp snooping [v lan <*vlan-id*>]**

Parameter: **<*vlan-id*>** is the VLAN number of IGMP Snooping information which is specified to show

Command mode: privilege user configuration mode

User guide: if do not specify VLAN number, show all VLANs' IGMP Snooping and Query brief information; if specify VLAN number, show the specified VLAN's IGMP Snooping and Query detail information

Example:

1. Show switch IGMP Snooping and Query brief information

```
SWITCH#show ip igmp snooping
igmp snooping status                :Enabled
IGMP information for VLAN 1:

igmp snooping vlan status           :Disabled
igmp snooping vlan query            :Disabled
---------------------------------

IGMP information for VLAN 2:

igmp snooping vlan status           :Enabled
igmp snooping vlan query            :Disabled
---------------------------------

IGMP information for VLAN 3:

igmp snooping vlan status           :Disabled
igmp snooping vlan query            :Disabled
---------------------------------

IGMP information for VLAN 4:
igmp snooping vlan status           :Disabled
igmp snooping vlan query            :Disabled
---------------------------------

IGMP information for VLAN 511:
```

igmp snooping vlan status :Disabled
igmp snooping vlan query :Disabled

IGMP information for VLAN 5:

igmp snooping vlan status :Disabled
igmp snooping vlan query :Disabled

Showing contents	explanation
igmp snooping status	if switch enable IGMP Snooping function
igmp snooping vlan status	All VLAN IGMP Snooping status in switch (enable/disable)
igmp snooping vlan query	All VLAN query status in switch (enable/disable)

2. Show IGMP Snooping and query detail information of VLAN1

SWITCH#show ip igmp snooping vlan 1
IGMP information for VLAN 1:

IGMP snooping status :Enabled
IGMP snooping vlan status :Disabled
IGMP snooping vlan query status :Enabled
IGMP snooping vlan static address :192.168.0.2 (default)
IGMP snooping vlan is querier :YES
IGMP snooping vlan querier address :192.168.0.2(self)
IGMP snooping vlan mrouter port :NULL
IGMP snooping vlan robustness :2
IGMP snooping vlan query interval :125
IGMP snooping vlan query max response time :10
IGMP snooping vlan query TX :2
IGMP snooping vlan query RX :0
IGMP snooping multicast information :
MAC address Member port list

01-00-5E-7F-FF-FA Ethernet3/5

Total multicast entries: 1

Sort by port:

Port State Type Group Address Life

Ethernet3/5 MEMBERS_PRESENT Snoop_Group_Addr 239.255.255.250 206

Total multicast groups on Ethernet3/5: 1

Showing contents	explanation
igmp snooping status	if switch enable IGMP Snooping function
igmp snooping vlan status	The vlan igmp snooping status (enable/disable)
igmp snooping vlan query	the vlan query status (enable/disable)
igmp snooping vlan static address	The vlan ip address
igmp snooping vlan is querier	If this vlan serve as querier
igmp snooping vlan querier address	IP address used to send Query to this VLAN
igmp snooping vlan mrouter port	The port number of this VLAN mrouter (if any)
igmp snooping vlan query TX	The number of query packets sent by this vlan
igmp snooping vlan query SX	The number of query packets received by this vlan
igmp snooping multicast mac	Multicast addresses learned by vlan igmp snooping forwarding table
igmp snooping multicast port	The member port name of each multicast MAC address in vlan igmp snooing forwarding table

7.4.1.2 show mac-address-table multicast

Command: **show mac-address-table multicast [vlan <*vlan-id*>]**

Function: show multicast MAC address table information

Parameter: ***<vlan-id>*** is VLAN ID of shown items

Command mode: privilege user configuration mode

Default; do not show the mapping of multicast MAC address and port

User guide: this command is used to show current switch multicast MAC address table information

Example: show multicast mapping in VLAN100

SWITCH#show mac-address-table multicast vlan 100

Vlan Mac Address Type Ports

---- ----------------------------- ------- -----------------------------------

100 01-00-5e-01-01-01 MULTI Ethernet1/2

7.4.1.3 debug igmp snooping

Command: **debug ip igmp snooping**

no debug ip igmp snooping

Function: turn on switch IGMP Snooping debugging switch; no command is to turn off debugging switch

Command mode: privilege user configuration

Default: turn off IGMP Snooping debugging switch

User guide: use to turn on IGMP Snooping debugging switch which can show the information of IGMP data packets which will be processed by switch

Example: turn on IGMP Snooping debugging switch

SWITCH#debug ip igmp snooping

7.4.2 IGMP Snooping Troubleshooting help

☞ Switch IGMP Snooping and IGMP Query functions are mutually exclusive. If enable Query function, Snooping function can't be used. So user must confirm which function you need on configuration

7.5 WEB Management

7.5.1 Enab IGMP snooping function

Click Device Advanced Configuration→Multicast Protocol Configuration→IGMP Snooping Configuration→Enable IGMP Snooping. Select "Open" and click "Apply", which is equivalent to CLI command in chapter 7.2.2.1

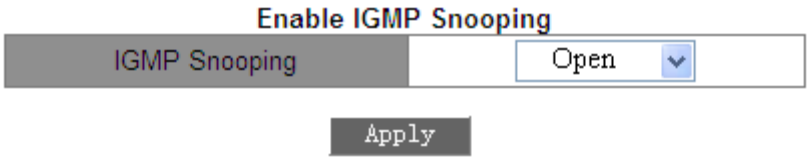


Figure 7-3 enable IGMP snooping

7.5.2 IGMP Snooping Configuration

Click Device Advanced Configuration→Multicast Protocol Configuration→IGMP Snooping Configuration→IGMP Snooping Configuration

Explanations:

VLAN ID-- configure snooping vlan ID

Snooping status- - enable or disable, it is equivalent to CLI command in chapter 7.2.2.2

Select VLan in VLAN ID, select "close" in snooping status, set other necessary parameters, click "Apply" to complete Snooping configuration

Explanations:

VLAN ID-- configure query vlan ID

Query status- - Open or Close. It is equivalent to CLI command in chapter 7.2.2.6

Robustness-- It is equivalent to CLI command in chapter 7.2.2.7

Query interval--It is equivalent to CLI command in chapter 7.2.2.8

Max Response-- max response time. It is equivalent to CLI command in chapter 7.2.2.9

Select Vlan in VLAN ID list, select Open in Query status, set other necessary parameters, click "Apply" to complete query configuration

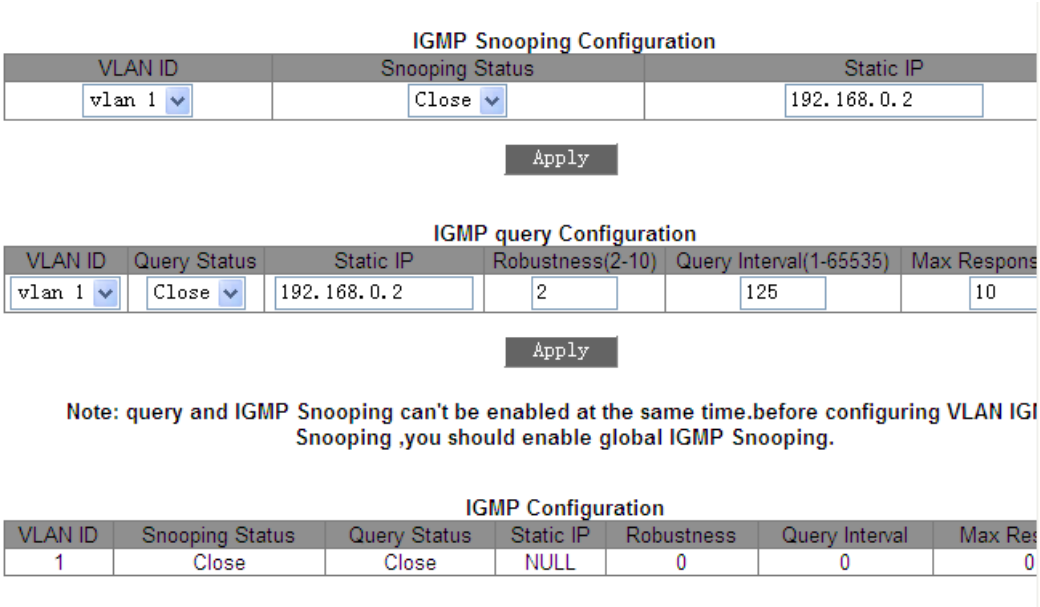


Figure 7-4 IGMP Snooping Configuration

7.5.2 IGMP Snooping static multicast configuration

Click Device Advanced Configuration→Multicast Protocol Configuration→IGMP Snooping Configuration→IGMP Snooping Static Multicast Configuration to open configuration page

Explanations:

VLAN ID- - configured VLAN ID

Operation type- - add or delete static multicast members

Multicast Group Member Port-- select multicast group member port

Multicast Address-- configure multicast address

It is equivalent to CLI command in chapter 7.2.2.4

Adding static multicast address: select vlan in VLAN ID, select add in operation type, select the port which will become multicast group member, input multicast address, click "Apply"

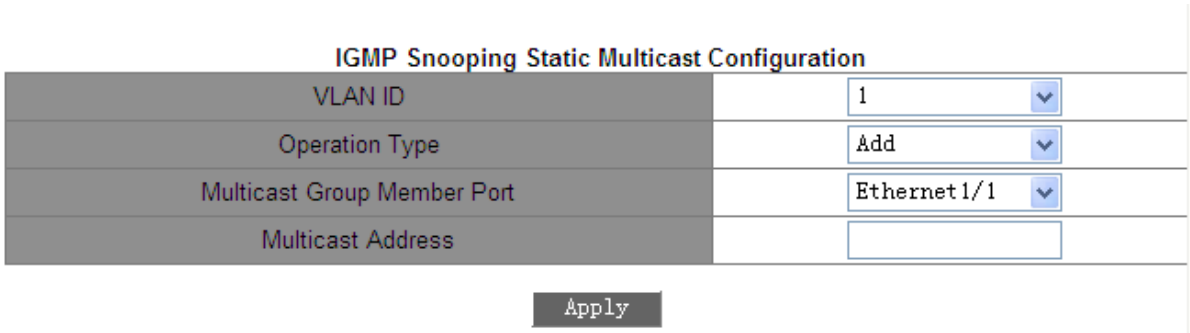


Figure 7-5: configure IGMP Snooping static multicast

7.5.4 Show IGMP Snooping Information

Click Device Advanced Configuration→Multicast Protocol Configuration→IGMP Snooping Configuration→Show IGMP Snooping Information. Select a VLAN in VLAN ID, it can show this VLAN's IGMP Snooping information. It is equivalent to CLI command in chapter 7.4.1.1

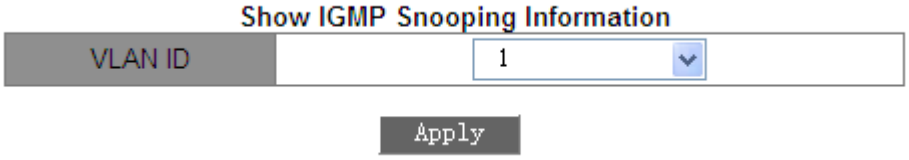


Figure 7-6 IGMP Snooping information

Chapter 8 ACL Configuration

8.1 ACL introduction

ACL (Access Control List) is a data packet filtering mechanism achieved by switch. By allowing or refusing data packets to enter network, switch is able to control network access to guarantee network secure operation. User can make rules based on specified information in message. Each rule describes the proper actions to different data packets: permit or deny. These riles can be applied in entrances and exits of particular switch ports, in this way, data flow with a certain direction in these particular ports must obey ACL rules to enter or exit from switch.

8.1.1 Access-list

Access-list is a set of statements. Each statement correspond to a particular rule. Each rule contains filtering information and proper action matching rule. Rule contains the information of effective portfolios of source IP, destination IP, IP protocol number, tcp port, etc. according to different standard, access-list contains following categories:

- According to filtering information, including ip access-list (above layer 3 information), mac access-list (layer 2 information), mac-ip access-list (above layer 2 information). Switch currently only support ip access-list.
- According to complex degree of configuration: standard and extended. Extended mode can specify to filter information more carefully.
- According to naming mode: numeric and named

To describe a piece of ACL from above three aspects

8.1.2 Access –group

After user made a group of access-list according to actual requirements, user can respectively apply them in different directions of different ports. access-group is a description of binding relationship between a specific access-list and a specific direction of a specific port. After making a access-group, all data packets which flow through this direction in this port will try to match specified access-list rule to decide the switching action is permit or deny.

8.1.3 Access-list action and global default action

Access-list action and default action are divides into two types: permit and deny. Detail is as follows:

- There are many rules in a access-list, data packet filter start from the first rule until it match a rule, then stop to match other rules.
- Global default action only work to IP packets in port ingress. For non-IP packets and data packets in port egress, the default forwarding action is permit.
- When a access-list is bound in a port egress, its rule ‘s action must be deny.

8.2 ACL Configuration

8.2.1 Task sequence of ACL configuration

1. configure access-list
    1) configure standard numeric IP access-list
    2) configure numeric extended IP access-list
    3)configure named standard IP access-list
        a) create a named standard IP access-list
        b) specify several permit or deny rule
        c) exit from access-list configuration mode
    4) configure named extended IP access-list

a) create a named extended IP access-list

b) specify several permit or deny rule

c) exit from access-list configuration mode

2 configure packet filter function

1) Enable global packet filter function
2) Configure default action

3 bind access-list in specific direction of specific port

1. Configure access-list

1) Configure standard numeric IP access-list

Command	explanation
Global configuration mode	
access-list *<num>* {deny | permit} {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} **no access-list *<num>***	Create a standard numeric IP access-list. If this access-list exist, add a rule; no command is to delete a standard numeric IP access-list

2) Configure numeric extended IP access-list

Command	explanation
Global configuration mode	
access-list *<num>* {deny | permit} icmp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [*<icmp-type>* [*<icmp-code>*]] [precedence *<prec>*] [tos *<tos>*]	Create a icmp numeric extended IP access rule. If this numeric extended access-list do not exist, create this access-list.
access-list *<num>* {deny | permit} igmp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [*<igmp-type>*] [precedence *<prec>*] [tos *<tos>*]	Create a igmp numeric extended IP access rule. If this numeric extended access-list do not exist, create this access-list.
access-list *<num>* {deny | permit} tcp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [ack | fin | psh | rst | syn | urg] [precedence *<prec>*] [tos *<tos>*]	Create a tcp numeric extended IP access rule. If this numeric extended access-list do not exist, create this access-list.
access-list *<num>* {deny | permit} udp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [precedence *<prec>*] [tos *<tos>*]	Create a udp numeric extended IP access rule. If this numeric extended access-list do not exist, create this access-list.

access-list <*num*> {deny | permit} {eigrp | gre | igrp | ipinip | ip | <*int*>} {{<*sIpAddr*> <*sMask*>} | any-source | {host-source <*sIpAddr*>}} {{<*dIpAddr*> <*dMask*>} | any-destination | {host-destination <*dIpAddr*>}} [precedence <*prec*>] [tos <*tos*>]	Create a numeric extended IP access rule which match specified IP protocol or all IP protocols. If this numeric extended access-list do not exist, create this access-list.
no access-list <*num*>	Delete a numeric extended IP access-list

3) Configure named standard IP access-list

Command	explanation
Global configuration mode	
ip access standard <*name*> **no ip access standard <*name*>**	Create a named standard IP access-list; no command is to delete this named standard IP access list

b) specify permit or deny rules

Command	explanation
Named standard IP access-list configuration mode	
[no] {deny | permit} {{<*sIpAddr*> <*sMask* >} | any-source | {host-source <*sIpAddr*>}}	Create a named standard IP access rule; no command is to delete this named standard IP access rule

c) exit from named standard IP access-list configuration mode

Command	explanation
Named standard IP access-list configuration mode	
Exit	Exit from named standard IP access-list configuration mode

4) Configure named extended IP access-list

a) Create a named extended IP access-list

Command	explanation
Global configuration mode	
ip access extended <*name*> **no ip access extended <*name*>**	Create a named extended IP access-list; no command is to delete this named extended IP access-list

b) Specify permit or deny rules

Command	explanation
Named extended IP access-list configuration mode	
[no] {deny | permit} icmp {{<*sIpAddr*> <*sMask*>} | any-source | {host-source <*sIpAddr*>}} {{<*dIpAddr*> <*dMask*>} | any-destination | {host-destination <*dIpAddr*>}} [<*icmp-type*> [<*icmp-code*>]] [precedence <*prec*>] [tos <*tos*>]	Create a icmp named extended IP access rule; no command is to delete this named extended IP access rule

[no] {deny | permit} igmp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [*<igmp-type>*] [precedence *<prec>*] [tos *<tos>*]	Create a igmp named extended IP access rule; no command is to delete this named extended IP access rule
[no] {deny | permit} tcp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [ack | fin | psh | rst | syn | urg] [precedence *<prec>*] [tos *<tos>*]	Create a tcp named extended IP access rule; no command is to delete this named extended IP access rule
[no] {deny | permit} udp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [precedence *<prec>*] [tos *<tos>*]	Create a udp named extended IP access rule; no command is to delete this named extended IP access rule
[no] {deny | permit} {eigrp | gre | igrp | ipinip | ip | *<int>*} {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [precedence *<prec>*] [tos *<tos>*]	Create a named extended IP access rule of other IP protocols; no command is to delete this named extended IP access rule

c) Exit from named extended IP access-list configuration mode

Command	explanation
Named extended IP access-list configuration mode	
Exit	Exsit from named extended IP access-list configuration mode

2. Configure packet filter function

1) Enable global packet filter function

Command	explanantion
Global configuration mode	
firewall enable	Enable global packet filter function
firewall disable	disable global packet filter function

2) Configure default action

Command	explanantion
Global configuration mdoe	
firewall default permit	Set default action to permit
firewall default deny	Set default action to deny

3. Bind accesslist to specific direction in specific port

Command	explanation
Physical interface configuration mode	
ip access-group *<name>* {in|out } **no ip access-group *<name>* {in|out}**	access-list。Use a access-list in a port's in/out direction; no command is to delete binding access-list in the port

8.2.2 ACL Configuraiton Commands

8.2.2.1 access-list(extended)

Command: **access-list *<num>* {deny | permit} icmp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [*<icmp-type>* [*<icmp-code>*]] [precedence *<prec>*] [tos *<tos>*]**

access-list *<num>* {deny | permit} igmp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [*<igmp-type>*] [precedence *<prec>*] [tos *<tos>*]

access-list *<num>* {deny | permit} tcp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [ack | fin | psh | rst | syn | urg] [precedence *<prec>*] [tos *<tos>*]

access-list *<num>* {deny | permit} udp {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [precedence *<prec>*] [tos *<tos>*]

access-list *<num>* {deny | permit} {eigrp | gre | igrp | ipinip | ip | *<int>*} {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr>* *<dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [precedence *<prec>*] [tos *<tos>*]

no access-list *<num>*

Function: create a numeric extended IP accress rule which match a specific IP protocol and all IP protocols. If this numeric extended access-list does not exist, create this access-list; no command is to delete this numeric extended IP access-list

Parameter: ***<num>*** is access-list number, 100-199; ***<sIpAddr>*** is souce IP address with a bot-decimal fomat; ***<sMask >*** is souce IP reverse mask with a dot-decimal format; ***<dIpAddr>*** is destination IP address with dot-decimal format; ***<dMask>*** is destination IP reverse mask with dot-decimal format, concerned position is 0 and ignored position is 1; ***<igmp-type>*** is the type of igmp, ***<icmp-type>*** is the type of icmp, ***<icmp-code>*** is icmp protocol number; ***<prec>*** is IP priority from 0-7; ***<tos>*** is tos value from 0-15; ***<sPort>*** is souce port number in a range of 0-65535; ***<dPort>*** is destination port number in a range of 0-65535

Command mode: global configuration mode

Default: no access-list

User guide: when user designates specific ***<num>*** for the first time, create a ACL of this number, then add table item in this ACL.

Example: create a numeric extended access-list with number 100. Deny icmp message and permit udp packets which destination address is 192.168.0.1 and destination port is 32

Switch(Config)#access-list 110 deny icmp any-source any-destination

Switch(Config)#access-list 110 permit udp any-source host-destination 192.168.0.1 dPort 32

8.2.2.2 access-list(standard)

Command: **access-list *<num>* {deny | permit} {{*<sIpAddr>* *<sMask >*} | any-source | {host-source *<sIpAddr>*}}**

no access-list *<num>*

Function: create a numeric standard IP access-list. If this access-list exists, please add a rule; no command is to delete a standard numeric IP access-list

Parameter: ***<num>*** is a access-list number in a range of 1-99; ***<sIpAddr>*** is source IP address with dot-decimal format; ***<sMask >*** is source IP reverse mask with dot-decimal format.

Command model global configuration mode
Default: no access-list
User guide: when user specify specific ***<num>*** for the first time, create a ACL of this number, then add table item in this ACL.
Example: create a standard numeric access-list with number 20; permit data packets with source address 10.1.1.0/24; deny data packets with source address 10.1.1.0/16
Switch(Config)#access-list 20 permit 10.1.1.0 0.0.0.255
Switch(Config)#access-list 20 deny 10.1.1.0 0.0.255.255

8.2.2.3 firewall

Command: **firewall { enable | disable}**
Function: enable firewall or disable firewall
Parameter: enable means firewall works, disable means firewall doesn't work
Default: firewall doesn't work
Command mode: global configuration mode
User guide: we can set access rules when firewall is enabled or disabled. But oany when firewall is under working, these rules can be applied in specific's in/out direction. If firewall doesn't work, all ACL bound in port will be deleted.
Example: enable firewall
Switch(Config)#firewall enable

8.2.2.4 firewall default

Command: **firewall default {permit | deny}**
Function: set firewall default action
Parameter: **permit** means packets are allowed to flow though; **deny** means datapackets are refused
Command mode: global configuration mode
Default: default action is permit
User guide: this command only influence IP packcets in port ingress. Packets are permited in other situations
Example: set firewall default action to deny
Switch(Config)#firewall default deny

8.2.2.5 ip access extended

Command: **ip access extended *<name>***
no ip access extended *<name>*
Function: create a naned extended IP access-list; no command is to delete this named extended IP access-list (including all table items)
Parameter: ***<name>*** is access-list name. the string length is 1-8 characters. All numbers are not allowed.
Command mode: global configuration mode
Default: no access-list
User guide: after using this command for the first time, a empty named access-list is created, which do not contain rules (biaoxiang)
Example: create a named extended IP access-list with the name tcpFlow
Switch(Config)#ip access-list extended tcpFlow

8.2.2.6 ip access standard

Command: **ip access standard *<name>***

no ip access standard *<name>*

Function: create a named standard IP access-list; no command is to delete this named standard IP access-list (including all table items)

Parameter: ***<name>*** is access-list name. the string length is 1-8 characters

Command mode: global configuration mode

Default: no access-list

User guide: after using this command for the first time, a empty named access-list is created, which do not contain table items

Example: create a named standard IP access-list with the name ipFlow

Switch(Config)#ip access-list standard ipFlow

8.2.2.7 ip access-group

Command: **ip access-group *<name>* { in|out }**

no ip access-group *<name>* { in|out }

Function: use a access-list in port ingress; no command is to delete the access-list which is bound in ports

Parameter: ***<name>*** is named access-list name. the string length is 1-8 characters

Command mode: physical interface configuration mode

Default: no binding ACL

User guide: only one ingress rule can be bound on a port. Access-list can not be used in out direction at present.

Example: bind a access-list with name aaa in port in direction

Switch(Config-Ethernet1/1)#ip access-group aaa in

8.2.2.8 permit | deny(extended)

Command: **[no] {deny | permit} icmp {{*<sIpAddr> <sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr> <dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [*<icmp-type>* [*<icmp-code>*]] [precedence *<prec>*] [tos *<tos>*]**

[no] {deny | permit} igmp {{*<sIpAddr> <sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr> <dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [*<igmp-type>*] [precedence *<prec>*] [tos *<tos>*]

[no] {deny | permit} tcp {{*<sIpAddr> <sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr> <dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [ack | fin | psh | rst | syn | urg] [precedence *<prec>*] [tos *<tos>*]

[no] {deny | permit} udp {{*<sIpAddr> <sMask>*} | any-source | {host-source *<sIpAddr>*}} [sPort *<sPort>*] {{*<dIpAddr> <dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [dPort *<dPort>*] [precedence *<prec>*] [tos *<tos>*]

[no] {deny | permit} {eigrp | gre | igrp | ipinip | ip | *<int>*} {{*<sIpAddr> <sMask>*} | any-source | {host-source *<sIpAddr>*}} {{*<dIpAddr> <dMask>*} | any-destination | {host-destination *<dIpAddr>*}} [precedence *<prec>*] [tos *<tos>*]

Function: create or delete a named extended IP access rule which match specific IP protocol or all protocols

Parameter: ***<sIpAddr>*** is source IP address with dot-decimal format; ***<sMask>*** is source IP reverse mask with dot-decimal format; ***<dIpAddr>*** is destination IP address with dot-decimal format, ***<dMask>*** is destination IP reverse mask with dot-decimal format, concerned posision is 0 and ignored position is 1; ***<igmp-type>*** is the type of igmp in a range of 0-225; ***<icmp-type>*** is the type of icmp in a range

of 0-255, ***<icmp-code>*** is icmp protocol number in a range of 0-255; ***<prec>*** is IP priority from 0-7; ***<tos>*** is tos value; ***<sPort>*** is souce port number in a range of 0-65535; ***<dPort>*** is destination port number in a range of 0-65535

Command mode: named extended IP access-list configuration mode

Default: no access-list

Example: create a extended access list with name udpFlow. Deny igmp message and permit udp packets whish destination address is 192.168.0.1 and destination port is 32

Switch(Config)#ip access-list extended udpFlow

Switch(Config-Ext-Nacl-udpFlow)#access-list 110 deny igmp any-source any-destination

Switch(Config-Ext-Nacl-udpFlow)#access-list 110 permit udp any-source host-destination 192.168.0.1 dPort 32

8.2.2.9 permit | deny(standard)

Command: **{deny | permit} {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}}**

no {deny | permit} {{*<sIpAddr>* *<sMask>*} | any-source | {host-source *<sIpAddr>*}}

Function: create a named standard IP access rule; no command is to delete thois named standard IP access rule

Parameter: ***<sIpAddr>*** is souce IP address with doc-decimal format; ***<sMask>*** is source IP reverse mask with dot-decimal format.

Command mode: named standard IP access-list configuration mode

Default: no access list

Example: permit datapackets with source address 10.1.1.0/24 , deny data packets with source address 10.1.1.0/16

Switch(Config)# ip access-list standard ipFlow

Switch(Config-Std-Nacl-ipFlow)# permit 10.1.1.0 0.0.0.255

Switch(Config-Std-Nacl-ipFlow)# deny 10.1.1.0 0.0.255.255

8.3 ACL example

Example 1:

User's configuration requirements: port 10 in switch connect with network segment and administaor don't want user to use ftp.

Configuration explanantion:

1. Create corresponding ACL
2. Configure packet fiter function
3. Bind ACL to port

Configuraiton steps:

Switch(Config)#access-list 110 deny tcp 10.0.0.0 0.0.0.255 any-destination d-port 21

Switch(Config)#firewall enable

Switch(Config)#firewall default permit

Switch(Config)#interface ethernet 1/10

Switch(Config-Ethernet1/10)#ip access-group 110 in

Switch(Config-Ethernet1/10)#ex

Switch(Config)#ex

Configuration results:

Switch#show firewall

Firewall Status: Enable.
Firewall Default Rule: Permit.
Switch#show access-lists
access-list 110(used 1 time(s))
    access-list 110 deny tcp 10.0.0.0 0.0.0.255 any-destination d-port 21

Switch#show access-group interface ethernet 1/10
interface name:Ethernet1/10
     the ingress acl use in firewall is 110.

8.4 ACL troubleshooting help

8.4.1 ACLmonitoring and debugging commands

8.4.1.1 show access-lists

Command: **show access-lists [*<num>*|*<acl-name>*]**

Function: show configured access control list

Parameter: ***<acl-name>*** is the named string of specific access control list; ***<num>*** is specific access control list number

Default: none

Command mode: authorized mode

User guide: if no specify the name of access control list, all access control lists will be shown. Show the number of times this ACL has been quoted.

Example:

Switch#show access-lists
access-list 10(used 0 time(s))
    access-list 10 deny any-source

access-list 100(used 1 time(s))
    access-list 100 deny ip any-source any-destination
    access-list 100 deny tcp any-source any-destination

Showing contents	explanation
access-list 10(used 1 time(s))	number ACL10 has no been quoted
access-list 10 deny any-source	deny all IP data packets
access-list 100(used 1 time(s))	Number ACL100 has been quoted 1 time
access-list 100 deny ip any-source any-destination	deny IP packets with any source IP address and destination IP address
access-list 100 deny tcp any-source any-destination	deny TCP packets with any source IP address and destination IP address

8.4.1.2 show access-group

Command: **show access-group [interface [Ethernet] *<name>*]**

Function: show ACL binding situation on port

Parameter: ***<name>*** is port name

Default: none

Command mode: authorized mode

User guide: if no specify port name, show ACL bound in all ports

Example:

Switch#show access-group
interface name:Ethernet1/2
the ingress acl use in firewall is 111.
interface name:Ethernet1/1
the ingress acl use in firewall is 10.

Showing contens	Explanation
interface name:Ethernet1/2	Binding situation in port Ethernet1/2
the ingress acl use in firewall is 111.	Port Ethernet1/2 ingress bind a numeric extended ACL with number 111
interface name:Ethernet1/1	Binding situation in port Ethernet1/1
the ingress acl use in firewall is 10.	Port Ethernet1/1 ingress bind a numeric standard ACL with number 10

8.4.1.3 show firewall

Command: **show firewall**
Function: show configuration information of packet filter function
Parameter: none
Default: none
Command mode: authorized mode
User guide: none
Example:
Switch#show firewall
Firewall Status: Enable.
Firewall Default Rule: Permit.

Showing contents	explanation
Firewall Status: Enable.	Enable packet filter function
Firewall Default Rule: Permit.	Packet filter default action is permit

8.4.2 ACL troubleshooting help

- Checking table items in ACL from up to dowm. If one match, ACL checking stops
- If ACL is not bound or ACL items do not match in port specific direction, use default fules
- Firewall default command only take effect to IP data packets in all port ingress, doesn't work to other types of packets
- One port bind one ingress ACL
- The number of ACL which can be bound successfully in port depends on the contents of ACL which has been bound and the hardware resource limit. If configuration fails due to the limit of hardware resource, related information will be shown to uers.
- If access-list contain rules which are same in filter information , but contradictory in action, this access-list can't be bound to port and error tips will appear, such as configure permit tcp any-source any-destination and deny tcp any-source any-destination at the same time
- It is able to configure ACL to deny some ICMP message to avoid virus attacks

8.5 WEB Management

Click Device Advanced Configuration→ACL configuration to open the submenu of ACL configuration. It contains following parts:
Numeric ACL Configuration—configure numeric ACL, including standard and extended types
ACL Name Configuration—configure ACL name, including standard and extended types

Filter Configuration—configure global strartup, default action and binding ACL to port

8.5.1 Add Standard Numeric ACL

Click Device Advanced Configuration→ACL configuration→Numeric ACL Configuration→Add Standard Numeric ACL to enter configuration page, which is equivalent to CLI command in chapter 8.2.2.2

Exaplanations:

ACL number (1-99)

Rule-- permit or deny

Soruce Address Type-- specified IP address or any address

Source IP Address

Reverse Network Mask

Adding a standard numeric ACL: input ACL number, specify other values, click "Add Rule"

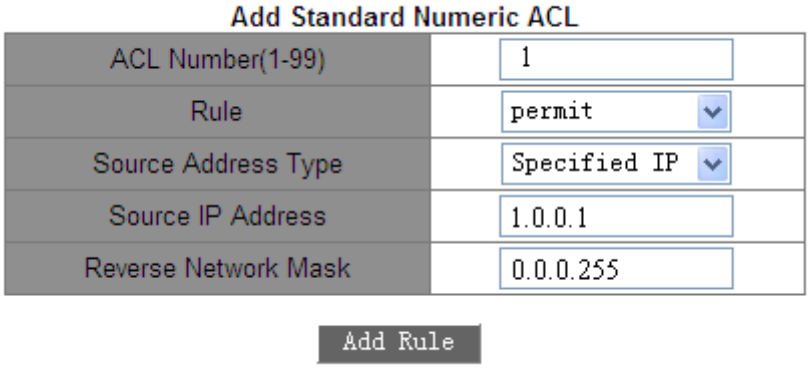


Figure 8-1: add standard numeric ACL rule

8.5.2 Delete Numeric ACL

Click Device Advanced Configuration→ACL configuration→Numeric ACL Configuration→Delete Numeric ACL to enter configuration page, which is equivalent to CLI command in chapter 8.2.2.1 and no command in 8.2.2.2.

Explanations:

ACL number (1-99)

Delete a numeric ACL: enter the ACL number, click "Remove"

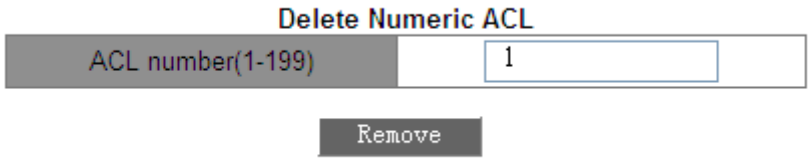


Figure 8-2 Delete numeric ACL

8.5.3 Numeric Extended ACL Configuration

It can configure the following types of numeric extended ACL

Add ICMP numeric extended ACL

Add IGMP numeric extended ACL

Add TCP numeric extended ACL

Add UDP numeric extended ACL

Add numeric extended ACLfor other protocols

Click button to enter corresponding configruaiton page, which is equivalent to CLI command in chapter 8.2.2.1

In Add Numeric Extended ACL for Other Protocols, user can select IP, EIGRP, IPINIP or Input protocol manually in Matched Protocol. When select input protocol manually, it is able to input protocol number at its right side.

8.5.4 Standard ACL Name Configuration and Delete Name ACL

Click Device Advanced Configuration→ACL configuration→ACL Name Configuration→Standard ACL Name Configuration to enter configuration page. Configuration method is the same as standard numeric ACL configuration, and the only difference is to input ACL name, no number, which is equivalent to CLI command in chapter 8.2.2.6

Exaplanations:

ACL name

Rule-- permit or demy

Soruce Address Type-- specified IP address or any address

Source IP Address

Reverse Network Mask

Operation type-- add or delete

Adding a standard ACL name: Eenter ACL name, specify other values, select "Add" and click "Apply"

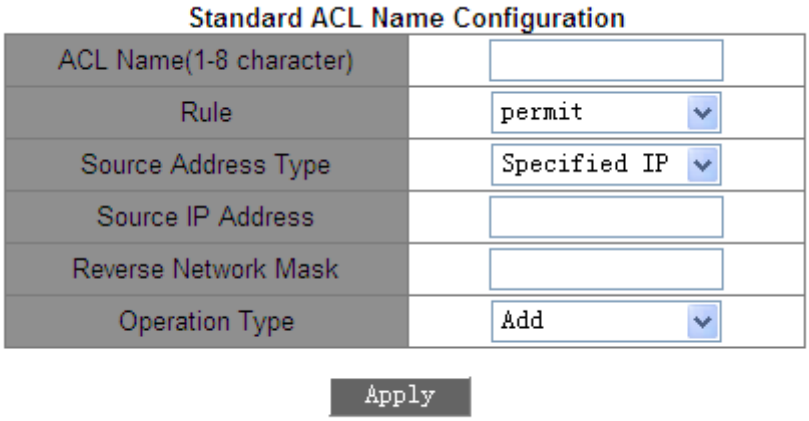


Figure 8-3 standard ACL name

Note: if select delete in Figure 8-3, it only delete one named ACL. If you want to completely delete, click Device Advanced Configuration→ACL Configuration→ACL Name Configuration→Delete Name ACL

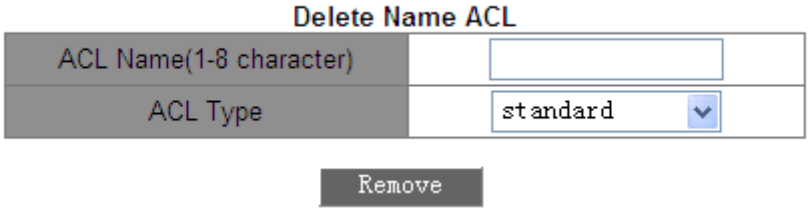


Figure 8-4 delete named ACL

8.5.5 Extended ACL name Configuration

Click Device Advanced Configuration→ACL configuration→ACL Name Configuration to open the submenu. It include following configuration types:

IP extended ACL configuration
ICMP extended ACL name configuration
IGMP extended ACL name configuration
TCP extended ACL name configuration
UDP extended ACL name configuration
Other protocol extended ACLname configuration

Click button to enter corresponding configruaiton page. The method is the same as numeric extended ACL configuration, the only difference is to input ACL name, not number, which is equivalent to CLI command in chapter 8.2.2.5

8.5.6 Fierwall Configuration

Click Device Advanced Configuration→ACL configuration→Filter Configuration→Firewall Configuration to enter configuration page.

Explanations:

Packet fitering-- open or close, which is equivalent to CLI command in chapter 8.2.2.3

Firewall default action-- **accept** means data packets are allowed to flow through, **refuse** means data packets are refused to flow through, which is equivalent to CLI command in chapter 8.2.2.4

Enable firewall: Select open, and accept, click "Apply"

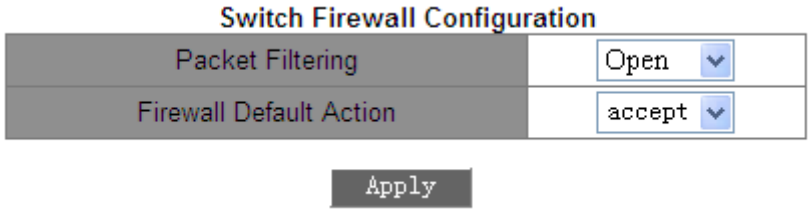


Figure 8-5: switch firewall configuration

8.5.7 ACL Port Binding

Click Device Advanced Configuration→ACL configuration→Filter Configuration→ACL Port Binding to enter configuration page, which is equivalent to CLI command in chapte 8.2.2.7

Exaplanations:

Port-- it is going to be bound

ACL name

ACL application direction—ingress or egress

Operation type-add or delete

ACL binding: selec the port, input ACL name, select ingress in direction, and add in operation type, click "Apply"

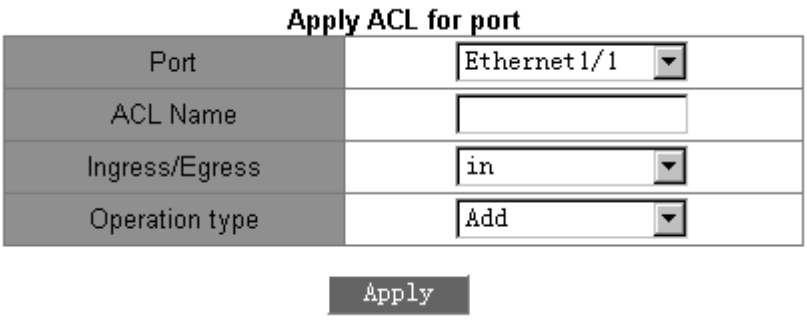


Figure 8-6 ACL port binding

Chapter 9 Port Channel Configuration

9.1 Port Channel introduction

Before introducing Port Channel, introduce the concept of Port Group first. Port Group is a physical port group at configuration layer. Physical ports which are configured to Port Group are able to attend link aggregation and become member ports in Port Channel. In logic, Port Group is not a port, but a port sequence. Physical ports in Port Group meet certain condition, they perform port aggregation to form a Port Channel and this port channel has the attributes of logical ports, so it become a real independent logical port. Port aggregation which is an abstact process in logic abstract a goup of port sequence which have same attributes to a logic port. Port Channel is an aggregation of physical ports, so it can be used as a physical port logically. For users, Port Channel can be look as one port to increase network bandwidth, and provice link backup function. Port aggregation function is often used when switch connect with router, host or other switches.

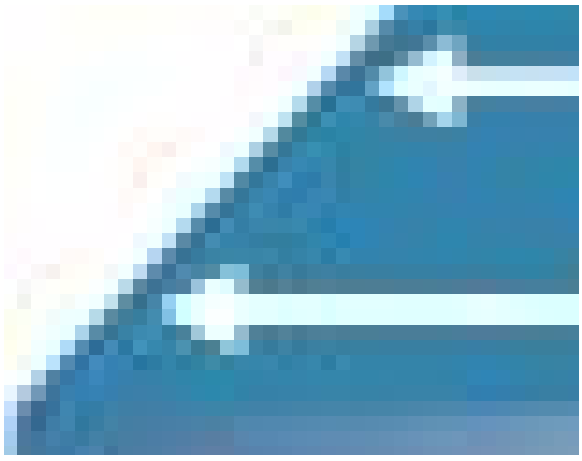


Figure 9-1: port aggregation

As figure above, port 1-4 in switch S1 are aggregated to a Port Channel which bandwidth is the sum of the bandwidth of 4 ports. if there is flow which is going to be tranmited form S1 through port channel to S2, port channel in S1 operate flow distribution calculation according to the low-order bit of source MAC address and destination MAC address of flow, then decide which member of Port Channel to take responsibility for the flow according to the calculation results. When a port connection fails in Port Channel, its flow which the port is responsible for will be distributed to other well-connected ports according to flow distribution calculation again. Flow distribution calculation depends on switch hardware.

SICOM6496 provides two kinds of methods to configure port aggregation: manual generation of Port Channel, LACP (Link Aggregation Control Protocol) dynamic generation of Port Channel. Only ports with full duplex mode can operate port aggregation.

In order to let Port Channel work normally, member ports of Port Channel must have following attributes:

- ☞ Ports work at full duplex mode
- ☞ Ports work with same speed
- ☞ Ports must be Access ports and belong to a same VLAN or are Trunk ports
- ☞ If ports are Trunk ports, their Allowed VLAn and Native VLAN attributes shouble be the same.

When SIOCM6496 manually configure Por Channel or dynamically generates Port Channel in LACP mode, system will automatically select the port with minimum number in Port Channel to be Master

port of Port Channel. If switch enable Spanning Tree function, Spanning tree treat Port Channel as a logical port and transmit BPDU frames from the master port.

Besides, the performance of port aggregation function has close relations with switch hareware. SICOM6496 series industrial Ethernet switch supports any two physical ports' aggregation. The max group member is 8, and it supports max 8 groups.

If ports are aggregated successfully, it can work as a normal port. SICOM6496 supports port channel configuration mode, which is the same as vlan and physical interface configuration mode, user can make related configuration to aggregation ports in port channel configuration mode.

9.2 Port Channel Configuration

9.2.1 Task sequence of port channel configuration

1. create s port group in global mode
2. respectively add these ports to specified groups in port mode
3. enter port channel configuration mode

1. Create a port group

Command	explanation
Global configuration mode	
port-group *<port-group-number>* [load-balance { src-mac | dst-mac | dst-src-mac | src-ip| dst-ip|dst-src-ip}] **no port-group <*port-group-number* 斜体> [load-balance]**	Create or delete a port group and set flow sharing mode

2. Add physical ports into port group

Command	explanation
Interface configuaito mode	
port-group *<port-group-number>* mode {active|passive|on} **no port-group *<port-group-number>***	Add port into port group and set mode

3. Enter port-channel configuration mode

Command	explanation
Global configuration mode	
interface port-channel *<port-channel-number>*	Enter port-channel configuration mode

9.2.2 Port Channel configuration mode

9.2.2.1 port-group

Command: **port-group *<port-group-number>* [load-balance { src-mac\|dst-mac \| dst-src-mac \| src-ip\| dst-ip\|dst-src-ip}]**

no port-group <*port-group-number* 斜体> [load-balance]

Function: create a port group and set flow sharing mode of this group. If no specify flow sharing mode, it is defult flow sharing mode; no command is to delete this group and restore defult flow sharing mode. Please input Load-balance to restore default flow sharing, otherwise, this group is deleted.

Parameter: ***<port-group-number>*** is a goup number of Port Channel in a range of 1~8. If this group number existm, system will infrom you error messge; **dst-mac** means flow sharing according to

destination MAC, **src-mac** means flow sharing according to source MAC address; **dst-src-mac** means flow sharing according to destination MAC and source MAC; **dst-ip** means flow sharing accoding to destination IP address; **src-ip** means flow sharing according to source IP address; **dst-src-ip** means flow sharing according to destination Ip and source IP. If modify flow sharing mode, but port groups has formed a Port Channel, this modification will take effect until next port aggregation.
Default: at default, switch ports do not belong to Port Channel and LACP protocol is disabled.
Command mode: switch global configuration mode
Example: create a port group and adopt defult flow sharing mode
SWITCH (Config)#port-group 1
Delete a port group
SWITCH (Config)#no port-group 1

9.2.2.2 port-group mode

Command: **port-group *<port-group-number>* mode {active|passive|on}**
no port-group *<port-group-number>*
Function: add physical port to Port Channel; no command is to delete port from Port Channel
Parameter: ***<port-group-number>*** is a group number of Port Chnnel in a range of 1~8; **active（0）is to** enable port LACP protocol and set Active mode; **passive（1）**is to enable port LACP protocol and set Passive mode; **on（2）** is to add port into Port Channel and disable LACP protocol
Command mode: interface configuration mode
Default: switch ports do no belong to Port Channel and disable LACP protocol
User guide: if this port does not exist, it will be created first. In a port group, the port modes should be the same in the group. It is subject to the first port which is added to the group. Adding the group with on mode is forced that means port aggregation in this side do not depends on the information at the other side. If there are 2 or more than 2 ports in the group and their vlan information are the same, so the ports in this group can be aggregated successfully.
Ports add into group with active or passive mode by operating lacp protocol, but at two sides, there must be ports at one side which are added into the group with active mode. If both are passive at two sides, ports can not be aggregated.
Example: add this port into port-group 1 with active mode in Ethernet1/1 interface mode
SWITCH (Config-Ethernet1/1)#port-group 1 mode active

9.2.2.3 interface port-channel

Command: **interface port-channel *<port-group-number>***
Function: enter port-channel onfiguration mode
Command mode: global configuration mode
Default: none
User guide: use **exit** command to exit from port-channel configuration mode and return to global configuration mode. When port is added in to port channel, the port channel will be automatically created; when there isn't port in port port channel, the channwl will be deleted.
Example: enter port-cahnnel configuration mode
SWITCH (Config)#interface port-channel 1
SWITCH (Config-If-Port-Channel1)#

9.3 Port Channel Example

Example 1: configure port channel in LACP mode

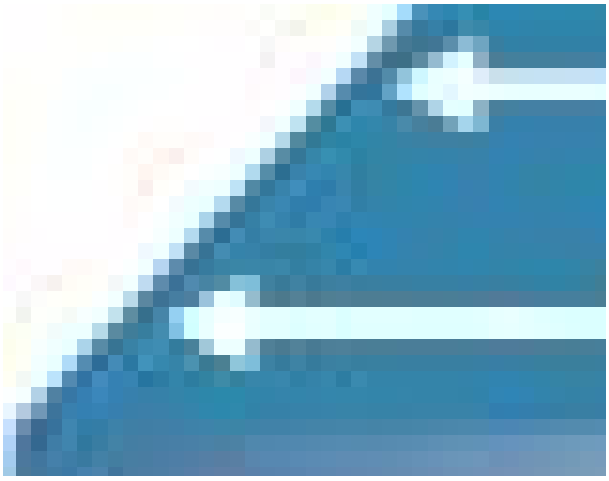


Figure 9-2 configure port channel in LACP mode

In the following explanation, use Switch to stand for SICOM6496

As above figure, port 1, 2, 3 in Switch 1 are access ports and all belong to valn1, add these three ports to group 1 with active mode, port 6, 8, 9 in Switch 2 are trunk ports and are allow all, add these three ports into group 2 with passive mode, connect aforementioned portd with network cables (4 cables in Figure 9-2)

Configuration steps:

Switch1#config
Switch1 (Config)#interface eth 1/1-3
Switch1 (Config-Port-Range)#port-group 1 mode active
Switch1 (Config-Port-Range)#exit
Switch1 (Config)#interface port-channel 1
Switch1 (Config-If-Port-Channel1)#

Switch2#config
Switch2 (Config)#port-group 2
Switch2 (Config)#interface eth 1/6
Switch2 (Config-Ethernet1/6)#port-group 2 mode passive
Switch2 (Config-Ethernet1/6)#exit
Switch2 (Config)# interface eth 1/8-9
Switch2 (Config-Port-Range)#port-group 2 mode passive
Switch2 (Config-Port-Range)#exit
Switch2 (Config)#interface port-channel 2
Switch2 (Config-If-Port-Channel2)#

Configuration results:

After a certin time, shell inform successful aggregation. Now port 1, 2, 3 in Switch 1 are aggregated to a port with a name of Port-Channel 1; port 6, 8, 9 in Switch 2 are aggregated to a port with name Port-Channel 2. They can both enter port-channel configuration mode to make configuration.

Example 2 : configure Port-Channel in ON mode

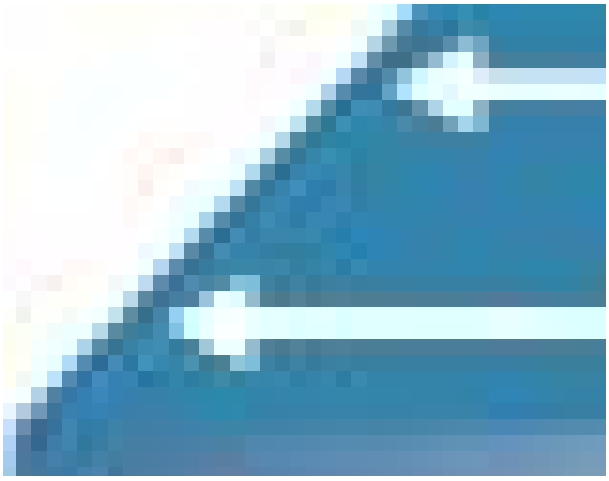


Figure 9-3 configure Port Channel in ON mode

As above figure, port 1, 2, 3 in Switch1 are access ports and all belong to vlan 1, add these three ports to group 1 with ON mode; port 6, 8, 9 in Switch 2 are trunk ports, and are allow all, add these three ports to group2 with ON mode

Configuration steps:

Switch1#config
Switch1 (Config)#interface eth 1/1
Switch1 (Config-Ethernet1/1)# port-group 1 mode on
Switch1 (Config-Ethernet1/1)#exit
Switch1 (Config)#interface eth 1/2
Switch1 (Config-Ethernet1/2)# port-group 1 mode on
Switch1 (Config-Ethernet1/2)#exit
Switch1 (Config)#interface eth 1/3
Switch1 (Config-Ethernet1/3)# port-group 1 mode on
Switch1 (Config-Ethernet1/3)#exit

Switch2#config
Switch2 (Config)#port-group 2
Switch2 (Config)#interface eth 1/6
Switch2 (Config-Ethernet1/6)#port-group 2 mode on
Switch2 (Config-Ethernet1/6)#exit
Switch2 (Config)# interface eth 1/8-9
Switch2 (Config-Port-Range)#port-group 2 mode on
Switch2 (Config-Port-Range)#exit

Configuration results:

After we add port 1, 2, 3 in Switch 1 to port-group1 one by one, we can see that adding ports into a group with ON mode are mandatory, switches at two sides can not complete aggregation through switching LACP PDU. When operate the command of adding port 3 to port- group1, port 1 and 2 are aggregated to form port-channel1; when port 3 is added into port-group1, port 1, 2, 3 are aggregated again to form port-channel 1. The three ports in Switch1 and Switch 2 are aggregated with ON mode and form aggregation ports.

9.4 Port Channel troubleshooting help

9.4.1 Monitoring and debugging command

9.4.1.1 show port-group

Command: **show port-group [*<port-group-number>*] {brief | detail | load-balance | port | port-channel}**

Parameter: ***<port-group-number>*** is the goup number of Port Channel in a range of 1~8; brief means showing brief information; detail means showing detail information, load-balance is to show flow sharing information; port is to show member ports information; port channel is to show information of aggregation port

Command mode: privilege user configuration mode

User guide: if no specify port-group-number, it means show all port-group information

Example: add port 1/1 and 1/2 into port-group 1

1. Show the brief information of switch port-group1

SWITCH#show port-group 1 brief

Port-group number : 1

Number of ports in group : 2 Maxports = 8

Number of port-channels : 0 Max port-channels : 1

Showing contents	explanation
Number of ports in group	The number of ports in port-group
Maxports	Max number of ports in the group
Number of port-channels	Whether it has been aggregated to a port-channel
Max port-channels	Max number of port-channels formed by port-group

2. Show detail information of port-group 1

SWITCH# show port-group 1 detail

Sorted by the ports in the group 1:

---

port Ethernet1/1 :

both of the port and the agg attributes are not equal

the general information of the port are as follows:

portnumber: 1 actor_port_agg_id:0 partner_oper_sys:0x000000000000

partner_oper_key: 0x0001 actor_oper_port_key: 0x0101

mode of the port: ACTIVE lacp_aware: enable

begin: FALSE port_enabled: FALSE lacp_ena: FALSE ready_n: TRUE

the attributes of the port are as follows:

mac_type: ETH_TYPE speed_type: ETH_SPEED_100M

duplex_type: FULL port_type: ACCESS

port Ethernet1/2 :

both of the port and the agg attributes are not equal

the general information of the port are as follows:

portnumber: 2 actor_port_agg_id:0 partner_oper_sys:0x000000000000

partner_oper_key: 0x0002 actor_oper_port_key: 0x0102

mode of the port: ACTIVE lacp_aware: enable

begin: FALSE port_enabled: FALSE lacp_ena: TRUE ready_n: TRUE

the attributes of the port are as follows:
mac_type: ETH_TYPE speed_type: ETH_SPEED_100M
duplex_type: FULL port_type: ACCESS

Showing contents	explanation
portnumber	Port number
actor_port_agg_id	the channel number of port when the port add into port-channel. If port can not be added into channel because the port parameter do not conform with channel parameter, it will show 0
partner_oper_sys	System ID at the other end
partner_oper_key	operational key at the other end
actor_oper_port_key	operational key at local end
mode of the port	Mode of the port adding into group
mac_type	port type: standard Ethernet port and fiber distributed data interface
speed_type	type of port speed: 10M, 100M, 1000M and 10G
duplex_type	type of port duplex: full-duplex and half-duplex
port_type	VLAN attribute of port: access port and trunk port

3. Show flow sharing information of switch port-group 1

SWITCH# show port-group 1 load-balance
The loadbalance of the group 1 based on src MAC address.

4. Show the information of member ports in switch port-group 1

SWITCH# show port-group 1 port
Sorted by the ports in the group 1 :
---
the portnum is 1
port Ethernet1/1 related information:

Actor part

	Administrative	Operational
port number	1	
port priority	0x8000	
aggregator id	0	
port key	0x0100	0x0101
port state		
LACP activety	.	1
LACP timeout	.	.
Aggregation	1	1
Synchronization	.	.
Collecting	.	.
Distributing	.	.
Defaulted	1	1
Expired	.	.

Partner part

	Administrative	Operational
system	000000-000000	000000-000000
system priority	0x8000	0x8000
key	0x0001	0x0001
port number	1	1
port priority	0x8000	0x8000
port state		
LACP activety	.	.
LACP timeout	1	1
Aggregation	1	1
Synchronization	.	.
Collecting	.	.
Distributing	.	.
Defaulted	1	1
Expired	.	.

Selected Unselected

Showing contents	explanation
portnumber	Port number
port priority	Port priorities
system	system ID
system priority	System priorities
LACP activety	if port is added into group with active mode, set 1
LACP timeout	If the port timeout mode is short, set 1
Aggregation	port can be arrgeated or not. If 0, it ,means whis port is an independent port which is not allowed to attend aggregation
Synchronization	means if the local port synchronize with th port at the other end
Collecting	means if port binding state reaches collecting state
Distributing	means if port binding state reaches distributing state
Defaulted	means if the local port use default parameter of the port at the other end
Expired	means if port receiving packet state machince is in expire state
Selected	means if port is selected

5. Show port-channel information in switch port-group 1

SWITCH# show port-group 1 port-channel

Port channels in the group 1:

Port-Channel: port-channel1

Number of port : 2 Standby port : NULL

Port in the port-channel :

```
Index           Port            Mode
---------------------------------------------------
1               Ethernet1/1     active
2               Ethernet1/2     active
```

Showing contents	explanation
Port channels in the group	If port-channel does not exist, the above printing information won't be shown
Number of port	the number of ports in port-channel
Standby port	The port is in standby state. Standby port means although this port meet the requirements of adding into channel, the number of ports in this channel has exceeded the max port numbers, so this port state is set to standby, not selected

9.4.1.2 debug lacp

Command: **debug lacp**

no debug lacp

Function: turn on swtch lacp debugging switch; no command is to turn off this debugging switch.

Command mode: privilege user configuration

Default: turn off switch lacp debugging switch

User guide: this command is used to turn on switch lacp debugging switch. It can show the information of switch processing lacp data packets

Example: turn on lacp debugging switch

SWITCH#debug lacp

9.4.2 Port Channel troubleshooting help

When problems accor inport-channel function configuration, pelase check if it is caused by the following reasons.

- Ports in port-channel group do not have same attributes including if duplex mode is full duplex, speed is forced to same speed, and VLAN attributes, etc. if they are different, please set them to the same
- Some commands can not be used in port-channel, such as bandwidth, ip, flow, etc
- Check if corresponding ports in the switch at the other end are configured to port-channel. An d ensure the configuration mode is the same. If it adopts manual configuration at the local, manual configuration should be set at the other end. If it adopts LACP dynamic generation, LACP dynamic generation need to be set at the other end, otherwise port channel can't work normally. One more thing if LACP protocol are used at both ends, at least one end adopts ACTIVE mode, otherwise LACP datagram can't be transmitted at two ends.

9.5 WEB Management

Click Device Basic Configuration→Port Channel Configuration to open the submenu to configure LACP port group and LACP port. LACP port group configuration is to configure and show group, LACP port configuration is to configure and show member ports.

9.5.1 LACP port group configuration

Click Device Basic Configuration→Port Channel Configuration→LACP PortGroup Configuration to

enter configuration page, which is equivalent to CLI command in chapter 9.2.2.1
Explanations:
LACP Group Number
Load Balance Mode-- include src-mac, dst-mac, dst-src-mac, src-ip, dst-ip, dst-src-ip
Operation type-- Add port group or Remove port group
After group configuration, the information will be shown at the bottom of the page.

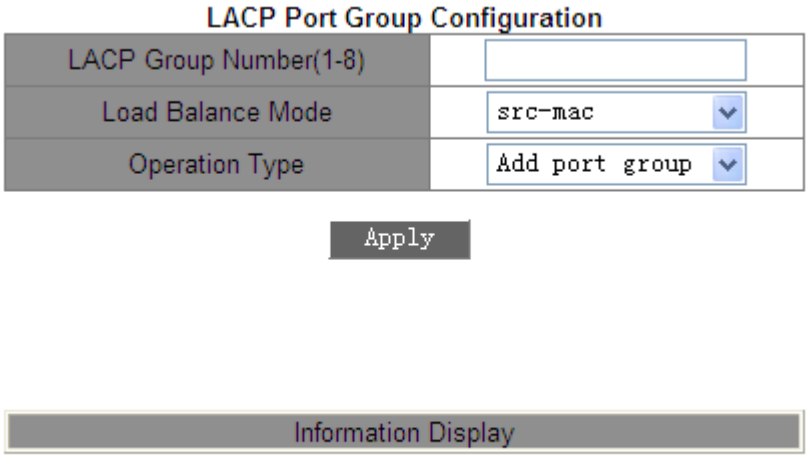


Figure 9-4 LACP port group configuration

9.5.2 LACP port configuration

Click Device Basic Configuration→Port Channel Configuration→LACP port configuration to enter configuration page. It is equivalent to CLI command in chapter 9.2.2.2
Exaplantions:
LACP group number
Port-- the name of port which is going to be added or removed
Port mode-- active, passive or on
Operation type-- add port to group or remove port from group

Enter group number, select port and port mode, select add port to group in operation type, click "Apply".

Show member ports:
After configuration, the information of member ports will be shown at the bottom of the page, which is equivalent to CLI command in chapter 9.4.1.1
Explanations:
Port-- the name of member ports
Port mode-- active, passive or on

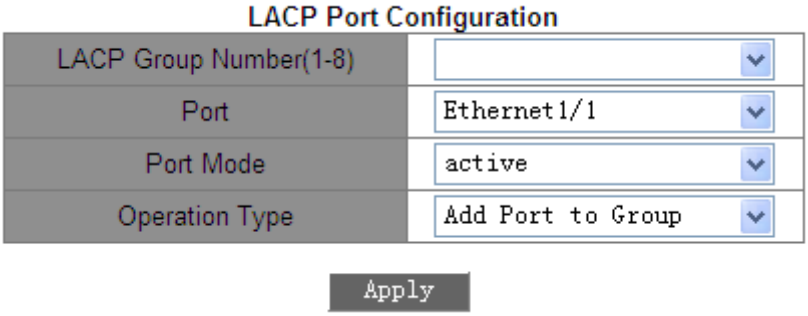


Figure 9-5 LACP port configuration

Chapter 10 DHCP Configuration

10.1 DHCP Introduction

DHCP〔RFC2131〕is a short of Dynamic Host Configuration Protocol. It can dynamically distribute P addresses to hosts sending requests from address pool and provide other network configuration parameters, such as default gateway, DNS server, default router and the positions of host mapping files in the network, etc. DHCP is the improvement of BootP protocol functions. Compared with BootP, DHCP is a mainstream technology. It can not only provide guiding information to diskless workstation, but also greatly decrease the burden of network administrator tracing, recording and manually distributing IP address and meanwhile reduce user configuration tasks and costs. Another advantage of DHCP is able to ease the situation of IP address being in short supply. If a user using a certain IP address quit from network environment, its IP address will be distributed to other user.

DHCP is a protocol based on Client-Server mode. DHCP client requests network address and configuration parameters from DHCP server and server offer network address and configuration parameters to client. When DHCP client and DHCP server are not in a same subnet, DHCP relay is required to transmit DHCP message to DHCP client and server. The process is as follows:

Figure 10-1: DHCP protocol interactive process

Explanations:

1. First, DHCP client broadcast DHCPDISCOVER packet in its subnet.
2. After DHCP receive DHCPDISCOVER packets, it will send DHCP packets which has IP address and other network configuration parameters to DHCP client
3. DHCP client make a selection in DHCPOFFER packets which it received, then broadcast DHCPREQUEST packets which carry the information of selected DHCP server
4. Selected DHCP server will transmit DHCPACK packets to DHCP client and DHCP client obtain the IP address and other network configuration parameters.

After above 4 steps, the process of dynamic distribution of host configuration is completed. But if DHCP server and DHCP client are not in a same network, server is unable to received DHCP broadcast message from client, so server won't send any DHCP message to client. Now, DHCP relay is needed to transmit these DHCP messages to complete DHCP message interactive process between DHCP client and server.

SICOM6496 supports DHCP server and DHCP relay function. DHCP server not only support dynamic distribution of IP address, but also supports manual binding of IP address (it is to distribute a fixed and long term IP address to specified hardware address or network device with specified device marks. The differences and connection between dynamic distribution and manual binding of IP address are that: 1) IP address obtained by dynamic mode is not fixed, but IP address obtained by manual binding is fixed. 2) The lease of IP address obtained by dynamic mode is the same as the lease of address pool and the time is limit. But in theory, the lease of IP address obtained by manual binding

is not time limit. 3) IP address which has been distributed dynamically, it does not allow manual binding. 4) Manual DHCP address pool is able to inherit network configuration parameters of dynamic DHCP address pool of related network segment.

10.2 DHCP server configuration

10.2.1 Task sequence of DHCP server configuration

1. enable/disable DHCP server function
2. Configure DHCP address pool
    1) Create or delete DHCP address pool
    2) Configure parameters of dynamic DHCP address pool
    3) Configure parameters of manual DHCP address pool
3. Enable the function of recording address conflicts
4. Configure the number of ping packets which are transmitted and the timeout

1. Enable/disable DHCP server

Command	explanation
Global configuration mode	
service dhcp **no service dhcp**	Enable DHCP server function

2. Configure DHCP address pool

1) Create or delete DHCP address pool

Command	explanation
Global configuration mode	
ip dhcp pool <*name*> **no ip dhcp pool <*name*>**	Configure DHCP address pool

2) Configure the parameters of dynamic DHCP address pool

Command	explanation
DHCP address pool configuration mode	
network-address <*network-number*> [mask | prefix-length] **no network-address**	Configure the range of assignable addresses for address pool
default-router [address1[address2[...address8]]] **no default-router**	Configure default gateway for DHCP client
dns-server [address1[address2[...address8]]] **no dns-server**	Configure DNS server for DHCP client
domain-name <*domain*> **no domain-name**	Configure domain name for DHCP client; no command is to delete domain name
netbios-name-server [address1[address2[...address8]]] **no netbios-name-server**	Configure Wins server address

netbios-node-type { **b-node|h-node|m-node|p-node|<*type-number*>**} **no netbios-node-type**	Configure node types of DHCP client
bootfile <*filename*> **no bootfile**	Configure the boot filename when DHCP client start up
next-server [address1[address2[...address8]]] **no next-server [address1[address2[...address8]]]**	Configure the server address which restore client boot file
option <*code*> {ascii <*string*> | hex <*hex*> | ipaddress <*ipaddress*>} **no option <*code*>**	Configrue network parameter values of codes which is specified by option
lease { days [hours][minutes] | infinite } **no lease**	Configure the lease period of addresses in address pool
Global configuration mode	
ip dhcp excluded-address <*low-address*> [<*high-address*>] **no ip dhcp excluded-address <*low-address*> [<*high-address*>]**	Exclude addresses which are not used in dynamic distribution from address pool

3) Configure parameters of manual DHCP address pool

Command	explanation
DHCP address pool configuration mode	
hardware-address <*hardware-address*> [{Ethernet | IEEE802|<*type-number*>}] **no hardware-address**	Specify user hardware address on manual distribution address
host <*address*> [<*mask*> / <*prefix-length*>] **no host**	Configure user IP address which is distributed to specified client on manual binding address
client-identifier <*unique-identifier*> **no client-identifier**	pecify user's unique identifier on manual binding address
client-name <*name*> **no client-name**	Configure user name on manual binding address

3. Enable the log function of recording address conflicts

Command	explanation
Global configuration mode	
ip dhcp conflict logging **no ip dhcp conflict logging**	Enable log function of DHCP server detecting address conflicts
Privilege user configuration mode	
clear ip dhcp conflict <*address* | *all*>	delect an address conflict record or all address conflict records

10.2.2 DHCP server configuration commands

10.2.2.1 bootfile

Command: **bootfile *<filename>***

no bootfile

Function: configure boot filename on startup of DHCP client; no command is to delete this configuration

Parameter: ***<filename>*** is the boot filename with max 128 characters

Command mode: DHCP address pool mode

User guide: specify boot filename for client. Generally, it is used in diskless workstation, upload and download configruaiton files from server when system starts up, combining next-server in use.

Example: bootfile address and name is c:\temp\nos.img

SWITCH(dhcp-1-config)#bootfile c:\temp\nos.img

Related Command: next-server

10.2.2.2 client-identifier

Command: **client-identifier *<unique-identifier>***

no client-identifier

Function: specify user's unique identifier on manual binding address; no command is to delete user identifier.

Parameter: ***<unique-identifier>*** is user identifier with dot-hexadecimal format

Command mode: DHCP address pool mode

User guide: this command combine with host command in use. When the identifier of client which sending requests conforms to specified identifier, DHCP server will distribute IP address defined in host command to client

Example: on manual binding, bind the IP address 10.1.128.160 with the user whose uniqe identifier is 00-10-5a-60-af-12

SWITCH(dhcp-1-config)#client-identifier 00-10-5a-60-af-12

SWITCH(dhcp-1-config)#host 10.1.128.160 24

Related Command: host

10.2.2.3 client-name

Command: **client-name *<name>***

no client-name

Function: on manual binding address, configure username; no command is to delete username

Parameter: ***<name>*** is username with max 255 characters.

Command mode: DHCP address pool mode

User guide: configure username to device which are manually bound. Do not include domain name on username configuration.

Example" set the name of user whose uniqe identifier is 00-10-5a-60-af-12 to network

SWITCH(dhcp-1-config)#client-name network

10.2.2.4 default-router

Command: **default-router *<address1>*[*<address2>*[...*<address8>*]]**

no default-router

Function: configure default gateway for DHCP client; no command is to delete default gateway

Parameter: ***address1...address8*** are IP addresses with dot-decimal format

Default: system does not set default gateway for DHCP client

Command mode: DHCP address pool mode

User guide: the IP address of default gateway and the IP address of DHCP client should be in the same

subnet segment. Switch supports max 8 gateway addresses. the priority of first gateway address is highest, so the priority of address1 is highest and second is address2, third is address3…
Example: set the default gateway of DHCP client to 10.1.128.2 and 10.1.128.100
SWITCH(dhcp-1-config)#default-router 10.1.128.2 10.1.128.100

10.2.2.5 dns-server

Command: **dns-server *<address1>*[*<address2>*[…*<address8>*]]**

no dns-server

Function: configure DNS server for DHCP client; no command is to delete DNS server
Parameter: ***address1…address8*** is IP address with dot-decimal format
Default: system does not configure DNS server for DHCP client
Command mode: DHCP address pool mode
User guide: system supports max 8 DNS server address and the first DNS server address has highest priority, so the priortity of address1 is highest, then second is address2, third is address 3…
Example: set DNS server address of DHCP client to 10.1.128.3
SWITCH(dhcp-1-config)#dns-server 10.1.128.3

10.2.2.6 domain-name

Command: **domain-name *<domain>***

no domain-name

Function: configure domain name for DHCP client; no command is to delete domain name
Parameter: ***<domain>*** is the domain name with max 255 characters
Command mode: DHCP address pool mode
User guide: specify domain name for client
Example: specify domain name of DHCP client to KYLAND.com.cn
SWITCH(dhcp-1-config)#domain¬-name KYLAND.com.cn

10.2.2.7 hardware-address

Command: **hardware-address *<hardware-address>* [{Ethernet | IEEE802|*<type-number>*}]**

no hardware-address

Function: on manual distribution address, specify user hardware address; no command is to delete this configuration.
Parameter: ***<hardware-address>*** is hardware address with hexadecimal format; **Ethernet | IEEE802** is the type of Ethernet protocol; ***<type-number>*** is a number to show protocol types defined by RFC in a range of 1~255, such as Ethernet is 0, and IEEE802 is 6.
Default: protocol type is Ethernet
Command mode: DHCP address pool mode
User guide: combine this command with host command in use on manual binding address. When the hardware address of client which sending requests conforms to specified hardware address, DHCP server will distribute IP address defined in host command to client
Example: on manual binding, bind the IP address 10.1.128.160 with the user whose hardware address is 00-00-e2-3a-26-04
SWITCH(dhcp-1-config)#hardware-address 00-00-e2-3a-26-04
SWITCH(dhcp-1-config)#host 10.1.128.160 24
Related Command: host

10.2.2.8 host

Command: **host *<address>* [*<mask>* | *<prefix-length>*]**

no host

Function: on manual binding address, distribute user IP address for specified client; no command is to delete the IP address

Parameter: ***<address>*** is IP address with dot-decimal format; ***<mask>*** is mask with dot-decimal format; ***<prefix-length>*** means to indicate by prefix, such as if tha mask is, indicated by prefix is 24; if the mask is, indicated by prefix is 30

Command mode: DHCP address pool mode

User guide: if only set IP address, do not configure mask and prefis on IP address configuration, and there is not any information about mask, default system will automatically distribute masks.

Combine this command with **hardware-address** or **client-identifier** command in use on manual binding address.

When the identifier and hardware address of client sending request conform to specified identifier and hardware address, DHCP server will distribute IP address defined in host command to client.

Example: on manual binding, bind the IP address 10.1.128.160 with the user whose hardware address is 00-10-5a-60-af-12

SWITCH(dhcp-1-config)#hardware-address 00-10-5a-60-af-12

SWITCH(dhcp-1-config)#host 10.1.128.160 24

Related Command: **hardware-address**、**client-identifier**

10.2.2.9 ip dhcp conflict logging

Command: **ip dhcp conflict logging**

no ip dhcp conflict logging

Function: enable log function of DHCP server detecting address conflicts; no command is to diable this log function

Default: this log function is enabled

Command mode: global configuration mode

User guide: if log function is enabled, once DHCP server detects address conflicts, it will record this conflict address to log. For the address which is has conflicts record in log, DHCP server won't operate dynamic distribution until these conflict records are deleted

Example: disable DHCP server log function

SWITCH(Config)#no ip dhcp conflict logging

Related Command: **clear ip dhcp conflict**

10.2.2.10 ip dhcp excluded-address

Command: **ip dhcp excluded-address *<low-address>* [*<high-address>*]**

no ip dhcp excluded-address *<low-address>* [*<high-address>*]

Function: exclude the addresses which are not used in dynamic distribution from address pool; no command is to delete this configuration.

Default: exclude one address

Command mode: global configuration mode

User guide: use this command to exclude an address or series of addresses from address pool. And these excluded addresses are kept for other uses by system administrator.

Example: keep address between 10.1.128.1 and 10.1.128.10. do not used in dynamic distribution

SWITCH(Config)#ip dhcp excluded-address 10.1.128.1 10.1.128.10

10.2.2.11 ip dhcp pool

Command: **ip dhcp pool *<name>***

no ip dhcp pool *<name>*

Function: configure DHCP address pool. Enter dhcp address pool mode; no command is to delete this address pool

Parameter: ***<name>*** is the name of address pool with max 255 characters

Command mode: global configuration mode

User guide: define a DHCP address pool in global mode. Enter DHCP address pool configuration mode

Example: define a address pool with name 1

SWITCH(Config)#ip dhcp pool 1

SWITCH(dhcp-1-config)#

10.2.2.12 loghost dhcp

Command: **loghost dhcp *<ip-address> <port>***

no loghost dhcp

Function: enable DHCP log function and specify DHCP log host IP address and port number; no command is to disable DHCP log function

Parameter: ***<ip-address>*** is IP address of DHCP log host with dot-decimal format; ***<port>*** is port number in a range of 0~65535

Command mode: global configuration mode

User guide: use this command to check DHCP address distribution records in corresponding log hosts. The host which executes logtest.exe program provided by KYLAND can be DHCP log host

Example: enable DHCP log function, log host is 192.168.1.101 with port number 45

SWITCH(Config)#loghost dhcp 192.168.1.101 45

10.2.2.13 lease

Command: **lease { [*<days>*] [*<hours>*][*<minutes>*] | infinite }**

no lease

Function: configure address lease of address pool; no command is to restore default value

Parameter: ***<days>*** is the number of days in a range of 0~365, ***<hours>*** is the number of hours in a range of 0~23; ***<minutes>*** is the number of minutes in a range of 0~59, infinite means permanent use.

Default: one day

Command mode: DHCP address pool mode

User guide: DHCP dynamically distribute network configuration parameters, not infinitely, so there is a limit in lease period. If lease period is long, DHCP can not exploit flexible and dynamic advantages to the full. If the lease period is short, it might increase the network communication and the network costs, so lease period can be set by network administrator according to the network features. The lease period of SICOM6496 is one day.

Example: set the lease period of DHCP address pool to 3 days 12 hours and 30 minutes

SWITCH(dhcp-1-config)#lease 3 12 30

10.2.2.14 netbios-name-server

Command: **netbios-name-server *<address1>*[*<address2>*[...*<address8>*]]**

no netbios-name-server

Function: configure Wins sercer address; no command is to delete Wins server

Parameter: ***address1...address8*** are IP addresses with dot-decimal format

Default: do not configure Wins server

Command mode: DHCP address pool mode

User guide: specify WINS server for client with max 8 WINS server. The firse Wins sercer address has highest priority, so the priority of address1 is highest, second is address2, third is address3….

10.2.2.15 netbios-node-type

Command: **netbios-node-type** {**b-node|h-node|m-node|p-node|*<type-number>***}

no netbios-node-type

Function: configure node types of DHCP client; no command is to delete thie configuration

Parameter: **b-node** is broadcast type; **h-node** is a mixed type which is peer to peer first, then broadcast; **m-node** is mix type which is broadcast first, then peer to peer; **p-node** is peer to peer type, ***<type-number>*** means node type is indicated in hexadecimal format in a range of 0～FF.

Default: do not specify node type for client

Command mode: DHCP address pool mode

User guide: if specify a node type for client, it is recommended to set the client node type to mixed type (peer to peer first, then broadcast)

Example: set the node type of address pool 1 client to broadcast

SWITCH(dhcp-1-config)#netbios-node-type b-node

10.2.2.16 network-address

Command: **network-address *<network-number>* [*<mask>* | *<prefix-length>*]**

no network-address

Function: configure assignable address range of address pool; no command is to delete this configuration

Parameter: ***<network-number>*** is network number; ***<mask>*** is mask with dot-decimal fomat; ***<prefix-length>*** means use prefix to indicate, such as if a mask is 255.255.255.0 , indicated by prefix is 24; if a mask is 255.255.255.252, indicated by prefix is 30. Please be noted that in use DHCP-SERVER and address mask configuration, the mask in address pool should be longer or equivalent to switch layer 3 port IP address mask in corresponding network segment.

Command mode: DHCP address pool mode

User guide: wehen DHCP server is used to dynamically distribute IP address, use this command to configure assignable IP address range. One address pool corresponds to one network segment. This command and manual binding address commands (**hardware-address**, **host)** are mutually exclusive.

Example: the assignable address of address pool 1 is 10.1.128.0/24

SWITCH(dhcp-1-config)#network-address 10.1.128.0 24

Related Command: **ip dhcp excluded-address**

10.2.2.17 next-server

Command: **next-server *<address1>*[*<address2>*[…*<address8>*]]**

no next-server

Function: configure the address of server which restores client bootfile; no command is to delete this configuration

Parameter: ***address1…address8*** are IP addresses with dot-decimal format

Command mode: DHCP address pool mode

User guide: specify server address which store client bootfile. Generally, it is used in diskless workstation, system need to upload and download configuration files from server, combining with **bootfile** in use.

Example: server address for file storage is 10.1.128.4

SWITCH(dhcp-config)#next-server 10.1.128.4

Related Command: **bootfile**

10.2.2.18 option

Command: **option *<code>* {ascii *<string>* | hex *<hex>* | ipaddress *<ipaddress>*}**

no option *<code>*

Function: configure network parameter values of option specified code; no command is to delete this option configuration

Parameter: ***<code>*** is network parameter code; ***<string>*** is ASCII type string with max 255 characters; ***<hex>*** is a vaule in hexadecimal mode with max 510 characters and length must be an even number; ***<ipaddress>*** is IP address with dot-decimal format with max 63 IP addresses.

Command mode: DHCP address pool mode

User guide: system provides not only ofern used commands in network configuration, but also univeral commands to configure network parameters.

Example: configure WWW server address to 10.1.128.240

SWITCH(dhcp-1-config)#option 72 ip 10.1.128.240

10.2.2.19 service dhcp

Command: **service dhcp**

no service dhcp

Function: enable DHCP server function; no command is to disable DHCP service

Default: DHCP service is disabled

Command mode: global configuration mode

User guide: DHCP services include DHCP server function and DHCP relay function

When enable DHCP service, DHCP server function and DHCP relay function both are enabled. But only enable DHCP server function, SIOCM6496 can distribute IP address to DHCP clients and enable relay function.

Example: enable DHCP server

SWITCH(Config)#service dhcp

10.3 DHCP relay configuration

When DHCP client and DHCP server are not in a same network segment, DHCP relay transmit DHCP message. The advantage of DHCP relay function is that we do not need to set DHCP server in each network segment, a DHCP server can provide network configuration parameters to many subnet clients, which reduce costs and is easy for management.

Figure 10-2 DHCP relay

As above figure, DHCP client and DHCP server are not in a network, DHCP client still work with following 4 steps and increase a DHCP relay forwarding function in each step

1. First, DHCP client broadcast DHCPDICOVER message; after DHCP relay receive the DHCPDISCOVER message from client, add its IP address into the relay agent fields of the message, then forward it to specified DHCP server (DHCP frame format is introduced in RFC2131)

2. After DHCP sercer recived DHCPDISCOVER forwarded by DHCP relay, DHCPOFFER message which carry network configuration parameters are transmited to DHCP client though DHCP relay
3. DHCP client select a DHCP server and broadcast DHCPREPLT message. DHCP relay process this message and forward it to DHCP server
4. After DHCP server received DHCPREPLY, transmit DHCPACK message to DHCP client through DHCP relay

DHCP relay can forward DHCP broadcast message to specified DHCP server and forward UDP broadcast message of other specific ptotocols to specified server.

10.3.1 Task sequence of DHCP relay configuration

1. Enable DHCP relay
2. Configure DHCP relay to forward DHCP broadcast message
3. Configure DHCP relay to forward other UDP broadcast message
4. Forbid DHCP relay forwarding DHCP broadcast message

1. Enable DHCP relay

As mentioned above, if enable DHCP service, DHCP server and DHCP relay functions are enabled, too.

2. Configure DHCP relay to forward DHCP broadcast message

Command	explanantion
Global configuration mode	
ip forward-protocol udp *<port>* **no ip forward-protocol udp *<port>***	When forwarding DHCP broadcast message, UDP port number is 67
Interface configuration mode	
ip helper-address *<ipaddress>* **no ip helper-address *<ipaddress>***	Specify the destination IP address of DHCP realy forwarding; no command is to delete this configuration

3. Configure DHCP relay to forward other UDP broadcast message

Command	explanation
Global configuration mode	
ip forward-protocol udp *<port>* **no ip forward-protocol udp *<port>***	Configure UDP port to specify DHCP relay forwarding protocol; no command is to delete this configuration
ip helper-address *<ipaddress>* **no ip helper-address *<ipaddress>***	Specify destination IP address of DHCP relay forwarding; no command is to delete this configuration

4. Forbid DHCP relay forwarding DHCP broadcast message

Command	explanation
Global configuration mode	
ip dhcp relay information policy drop **no ip dhcp relay information policy drop**	When a layer 3 switch serve as DHCP relay, configure the relay forwarding policy to be no forwarding DHCP message; no command is to restore forwarding DHCP message

10.3.2 DHCP relay configuration commands

10.3.2.1 ip forward-protocol udp

Command: **ip forward-protocol udp <port>**

no ip forward-protocol udp <port>

Function: configure DHCP relay to forward udp broadcast message of port; no command is to delete this configuration.

Default: DHCP relay forward DHCP broadcast message (udp port id 67)

Command mode: global configuration mode

User guide: the forwarding destination will be st in the next command **ip helper-address**

Example: forward tftp packets, and destination server address is 192.168.1.5

SWITCH(Config)#ip forward-protocol udp 69

SWITCH(Config)#interface e 1/1

SWITCH(Config-Ethernet1/1)#ip helper-address 192.168.1.5

10.3.2.2 ip helper-address

Command: **ip helper-address *<ip-address>***

no ip helper-address *<ip-address>*

Function: specify the destination address of DHCP relay forwarding udp message; no command is to delete this configuration

Default: the default DHCP relay is set to the address of forwarding DHCP broadcast message

Command mode: interface configuration mode

User guide: DHCP relay forwarding server address corresponds to the port of forwarding UDP, which means DHCP relay only forward UDP protocol message to corresponding server, it does not forward all UDP messages to all server. By default, DHCP relay forwards DHCP message of UDP port 67 to DHCP server. After using command, start to configure this command **ip forward-protocol udp *<port>*** which configured forwarding address receives UDP message of port with port number ***<port>,*** but not UDP message at default. If another group of UDP forwarding protocol and its receiving server addrss need to be configured, combine another command **ip forward-protocol udp *<port>*** with this command in use. Please refer to chapter 14.4 DHCP configuration example for more details.

10.3.2.3 ip dhcp relay information policy drop

Command: **ip dhcp relay information policy drop**

no ip dhcp relay information policy drop

Function: when layer 3 switch serves as DHCP relay, configure the relay forwarding policy to not forwarding DHCP message; no command is to restore forwarding DHCP message

Default: DHCP relay forward DHCP broadcast message

Command mode: global configuration mode

User guide: when DHCP relay should not forward DHCP message for a special reason, use this command to disable DHCP relay forwarding DHCP message function

Example: disable layer 3 switch DHCP broadcast message forwarding function

SWITCH(Config)# ip dhcp relay information policy drop

10.4 DHCP configuration example

Example 1:

In oeder to decrease the configuration burden of network administrator and user, a company use SICOM6496 as DHCP server. Admin VLAN IP address is 10.16.1.2/24. Company LAN is divided to A and B two parts due to office locations. The network configuration of A and B is as follows:

PoolA(network 10.16.1.0)		PoolB(network 10.16.2.0)	
Device	IP address	device	IP address

default gateway	10.16.1.200 10.16.1.201	default gateway	10.16.2.200 10.16.2.201
DNS server	10.16.1.202	DNS server	10.16.2.202
Wins server	10.16.1.209	WWW server	10.16.2.209
Wins node types	H-node		
Lease	3 days	Lease	1 day

In A, distribute fixed IP address of 10.16.1.210 to a device with MAC address of 00-03-22-23-dc-ab, named management to meet working requirement

SWITCH(Config)#interface vlan 1
SWITCH(Config-Vlan-1)#ip address 10.16.1.2 255.255.255.0
SWITCH(Config-Vlan-1)#exit
SWITCH(Config)#ip dhcp pool A
SWITCH(dhcp-A-config)#network 10.16.1.0 24
SWITCH(dhcp-A-config)#lease 3
SWITCH(dhcp-A-config)#default-route 10.16.1.200 10.16.1.201
SWITCH(dhcp-A-config)#dns-server 10.16.1.202
SWITCH(dhcp-A-config)#netbios-name-server 10.16.1.209
SWITCH(dhcp-A-config)#netbios-node-type H-node
SWITCH(dhcp-A-config)#exit
SWITCH(Config)#ip dhcp excluded-address 10.16.1.200 10.16.1.210
SWITCH(Config)#ip dhcp pool B
SWITCH(dhcp-B-config)#network 10.16.2.0 24
SWITCH(dhcp-B-config)#lease 1
SWITCH(dhcp-B-config)#default-route 10.16.2.200 10.16.2.201
SWITCH(dhcp-B-config)#dns-server 10.16.2.202
SWITCH(dhcp-B-config)#option 72 ip 10.16.2.209
SWITCH(dhcp-config)#exit
SWITCH(Config)#ip dhcp excluded-address 10.16.2.200 10.16.2.210
SWITCH(Config)#ip dhcp pool A1
SWITCH(dhcp-A1config)#host 10.16.1.210
SWITCH(dhcp-A1-config)#hardware-address 0003.2223.dcab
SWITCH(dhcp-A1-config)# client-name management
SWITCH(dhcp-A1-config)#exit

Example 2:

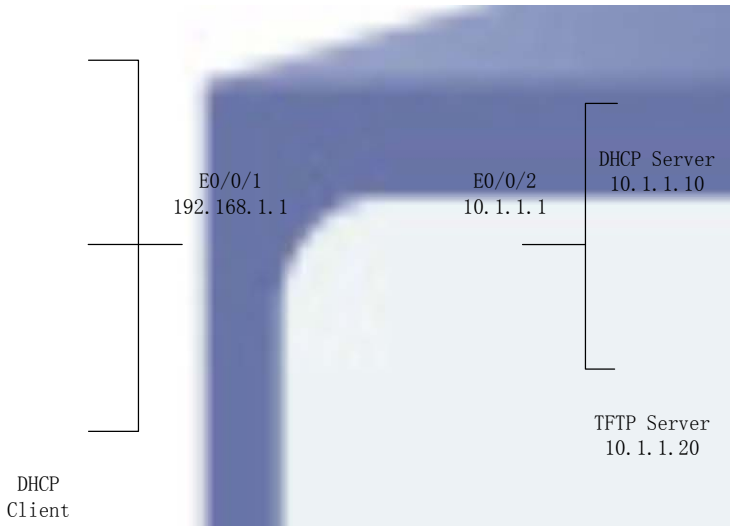


Figure 10-3 DHCP relay configuration

Ad above figure: configure KYLAND to be DHCP relay. DHCP server address is 10.1.1.10; TFTP server address is 10.1.1.20. Its configuration is as follows:

SWITCH(Config)#interface vlan 1
SWITCH(Config-Erthernet1/1)#ip address 192.168.1.1 255.255.255.0
SWITCH(Config-Erthernet1/1)#exit
SWITCH(Config)#interface Ethernet 1/2
SWITCH(Config-Erthernet1/2)#switchport access vlan 2
SWITCH(Config-Erthernet1/2)#ip address 10.1.1.1 255.255.255.0
SWITCH(Config-Erthernet1/2)#exit
SWITCH(Config)#ip forward-protocol udp 67
SWITCH(Config)#interface vlan 1
SWITCH(Config-Erthernet1/1)#ip help-address 10.1.1.10
SWITCH(Config-Erthernet1/1)#exit
SWITCH(Config)#ip forward-protocol udp 69
SWITCH(Config)#interface vlan 1
SWITCH(Config-erthernet1/1)#ip help-address 10.1.1.20

Attention: DHCP server address and TFTP server address must be set separately because their received UDP protocols are different. It is recommended that combine the command **ip forward-protocol udp *<port>*** with command **ip helper-address *<ipaddress>*** in use. Command **ip help-address** can only be configured at layer 3 port, can't be directly configured at layer 2 port.

Tips:

When there is DHCP/BootP clinets connecting with the ports which is in switch VLAN1, this client can obtain the addresses in 10.16.1.0/24 network segment, can not obtain the addresses in 10.16.2.0/24 network segment, because when the broadcast packets sent by Client is forwarded by switch VLAN interface, it apply the address which should be in the same segment of VLAN interface and the switch VLAN interface IP address is 10.16.1.2/24, the IP address of Client is in the 10.16.1.0/24 segment. IF DHCP/BootP Client wishes to apply the address in 10.16.2.0/24 segment, the gateway which forward Client broadcast packets must be in the 10.16.2.0/24 segment. If it wants to obtain IP address of 10.16.2.0/24 address pool, please ensure this client gateway ia able to reah switch.

10.5 DHCP troubleshooting help

10.5.1 Monitoring and debugging commands

10.5.1.1 clear ip dhcp binding

Command: **clear ip dhcp binding {*<address>* | all }**

Function: delete binding records of a specified IP address and its hardward assress, or bind records of all IP addresses and corresponding hardware addresses

Parameter: ***<address>*** is specified IP address which has binding records with dot-decimal format. **all** means all IP addresses which have binding records

Command mode: privilege user configuration mode

User guide: use **show ip dhcp binding** command to check binding information of IP address and its corresponding DHCP client hardware address. When DHCP server learn that a DHCP clinet does not use distributed IP address for a special reason and it is in lease period, but DHCP server won't automatically delete this binding information, now syatem administrator can use this command to manually delete this anto-binding of IP address and client hardware address. If use **all**, it will delete all auto-binding records, so all addresses in DHCP address pool will be re-distributed.

Example: delete all binding records of IP addresses and hardware addresses

SWITCH#clear ip dhcp binding all

Realted Command: **show ip dhcp binding**

10.5.1.2 clear ip dhcp conflict

Command: **clear ip dhcp conflict {*<address>* | all }**

Function: delete address which has conflict records in address conflict log

Parameter: ***<address>*** is a specified address which has conflict records; **all** means all IP address which have conflict records

Command mode: privilege user configuration mode

User guide: use **show ip dhcp conflict** command to check which IP address has conflicts in use. Use this command to delete an address's conflict records. If use **all,** it will delete all addresses conflict records. After delection of address conflict records, these addresses can be reused by DHCP server.

Example: network administrator check conflict log file and find out that the 10.1.128.160 address which has conflict records has not been used, so delete this address records from address conflict files.

SWITCH#clear ip dhcp conflict 10.1.128.160

Related Command: **ip dhcp conflict logging，show ip dhcp conflict**

10.5.1.3 clear ip dhcp server statistics

Command: **clear ip dhcp server statistics**

Function: delete DHCP server statistical records and clear DHCP server counter to zero

Command mode: authorized use configuration mode

User guide: use **show ip dhcp server statistics** command to check statisticical information of DHCP server counter. All statistical information is an accumulative value. Use this command to clear counter to zero and it is convenient for checking statistical information.

Example: clear DHCP server counter to zero

SWITCH#clear ip dhcp server statistics

Related Command: **show ip dhcp server statistics**

10.5.1.4 show ip dhcp binding

Command: **show ip dhcp binding [[*<ip-addr>*] + [type {all | manual | dynamic}] [count]]**

Function: show binding information of IP address and MAC address

Parameter: ***<ip-addr>*** is a specified IP address with dot-decimal format; all means all binding types (manual binding and dynamic configuration); manual means manual binding type; dynamic means dynamic distribution type; count means showing the number of DHCP address binding items

Command mode: privilege user configuration mode

Example:

SWITCH#sh ip dhcp binding

IP address	Hardware address	Lease expiration	Type
10.1.1.233	00-00-E2-3A-26-04	Infinite	Manual
10.1.1.254	00-00-E2-3A-5C-D3	60	Automatic

Showing contents	explanation
IP address	IP address distributed to DHCP client
Hardware address	hardware address of DHCP client
Lease expiration	he validity period of DHCP client being able to use this IP address
Type	Types: manual binding or dynamic distribution

10.5.1.5 show ip dhcp conflict

Command: **show ip dhcp conflict**

Function: showing log information of IP addresses which have conflict records

Command mode: privilege user configuration mode

Example:

SWITCH#sh ip dhcp conflict

IP Address	Detection method	Detection Time
10.1.1.1	Ping	FRI JAN 02 00:07:01 2002

Showing contents	explanation
IP Address	IP address which has conflicts
Detection method	The method of detecting conflicts
Detection Time	The time of detecting conflicts

10.5.1.6 show ip dhcp server statistics

Command: **show ip dhcp server statistics**

Function: show statistical information of various DHCP data packets in DHCP server

Command mode: privilege user configuration mode

Example:

SWITCH#sh ip dhcp server statistics

Memory usage	389
Address pools	3
Database agents	0
Automatic bindings	2
Manual bindings	0
Conflict bindings	0
Expiried bindings	0
Malformed message	0

```
Message                 Recieved
BOOTREQUEST              3814
DHCPDISCOVER             1899
DHCPREQUEST               6
DHCPDECLINE               0
DHCPRELEASE               1
DHCPINFORM                1

Message                 Send
BOOTREPLY                1911
DHCPOFFER                 6
DHCPACK                  6
DHCPNAK                   0
DHCPRELAY                1907
DHCPFORWARD               0
SWITCH#
```

Showing contents	explanation
Memory usage	Memory utilization ratio
Address pools	The number of configured DHCP address pool
Database agents	The number of database agents
Automatic bindings	he number of auto-distributed addresses
Manual bindings	the number of munual binding addresses
Conflict bindings	the number of address conflicts
Expiried bindings	the number of binding expired
Malformed message	the number of error messages
Message Recieved	the statistics of received DHCP data packets
BOOTREQUEST	the total number of received data packets
DHCPDISCOVER	the number of DHCPDISCOVER packets
DHCPREQUEST	the number of DHCPREQUEST packets
DHCPDECLINE	the number of DHCPDECLINE packets
DHCPRELEASE	the number of DHCPRELEASE packets
DHCPINFORM	the number of DHCPINFORM packets
Message Send	the statistics of sending DHCP data packets
BOOTREPLY	the total number of transmitted data packets
DHCPOFFER	the number of DHCPOFFER packets
DHCPACK	the number of DHCPACK packets
DHCPNAK	The number of DHCPNAK packets
DHCPRELAY	the number of DHCPRELAY packets
DHCPFORWARD	The number of DHCPFORWARD packets

10.5.1.7 debug ip dhcp server

Command: **debug ip dhcp server { events|linkage|packets }**

no debug ip dhcp server { events|linkage|packets }

Function: open DHCP server debugging information; no command is to close DHCP server debugging information

Default: close debugging switch

Command mode: privilege user configuration mode

10.5.2 DHCP troubleshooting help

DHCP client is unable to obtain IP address and other network parameters. On the basis of ensuring DHCP client hardware, cables are in good condition, please check the reasons as follows and their solutions:

- First, check if DHCP server is enabled. If not, please enable related DHCP server
- If DHCP Clent and server are not in a same physical network, check if the router in the middle which is in charge of forwarding DHCP message supports DHCP relay function. If the middle router does not support DHCP relay function, it is recommend to change the router or update its version to make it support DHCP relay function
- The problem user often meet is that although DHCP Client is connected with switch, they can not obtain IP address. In this case, please check if there is a address pool which is in a same segment with switch VLAN interface. If not, please add the address pool which in VLAN interface segment. (this does not means that KYLAND does not has the ability of distributing IP address to other segment, pelase refer to second solution)
- In DHCP service, dynamic distribution IP address and manual distribution IP address are mutually exclusive, that means when operate commands network and host in a address pool, only one command can take effect. And only a pair of IP-MAC can be configured in a manual address pool. If binding many pairs are needed, please create many address pools and configure IP-MAC binding in each address pool, otherwise new configuration will cover old one.

10.6 WEB Management

Click Device Advanced Configuration→DHCP Configuration to expand the submenu. User can manage switch DHCP functions

10.6.1 DHCP server configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration to open the submenu. User can manage switch DHCP function.

10.6.1.1 Enable DHCP

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→Enable DHCP to open/close DHCP server and set address conflicts log server, etc functions

- DHCP server status—opne/close DHCP server function, which is equivalent to command 10.2.2.19
- Conflict logging status—open/close the logging function of DHCP server detecting address conflicts, which is equivalent to CLI command in chapter 10.2.2.9
- Logging server (optional)-- specify IP address of DHCP logging host, which is equivalent to CLI command in chapter 10.2.2.12
- Logging server port (optional, 1-65535)-- specify port number of DHCP logging host

Select open in DHCP server status, open in conflicts logging status, set logging server address to 10.0.0.1 and logging server port to 45, click “Apply” to complete configuration

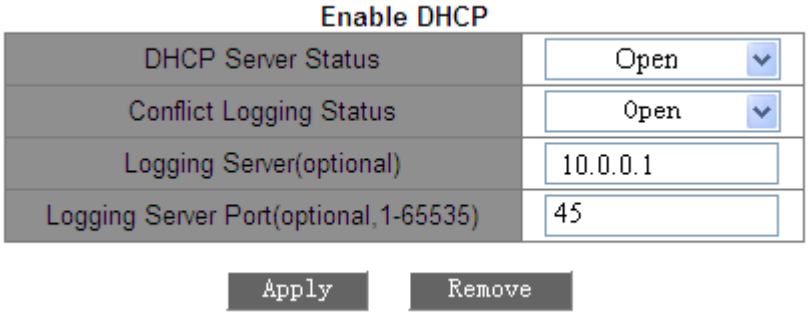


Figure 10-4 enable DHCP configuration

10.6.1.1.1 Dddress pool configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→address pool management to configure DHCP address pool Function:

- ☞ DHCP pool name (1-32 characters)-- define a DHCP address pool in global mode, which is equivalent to CLI command in chapter 10.2.2.11
- ☞ Domain pool domain name (1-255 characters)-- configure domain name for DHCP client which is equivalent to CLI command in chapter 10.2.2.6
- ☞ Address range for allocating - configure distributable address range of address pool, which is equivalent to CLI command in chapter 10.2.2.16
- ☞ DHCP client node type - configure DHCP client node types: broadcast node, Hybrid node (peer to peer first, then broadcast), Mixed node (broadcast first, then peer to peer), Peer-to –peer node, which is equivalent to CLI command in chapter 10.2.2.15
- ☞ Address lease timeout-- configure the lease timeout of address in address pool, which is equivalent to CLI command in chapter 10.2.2.13

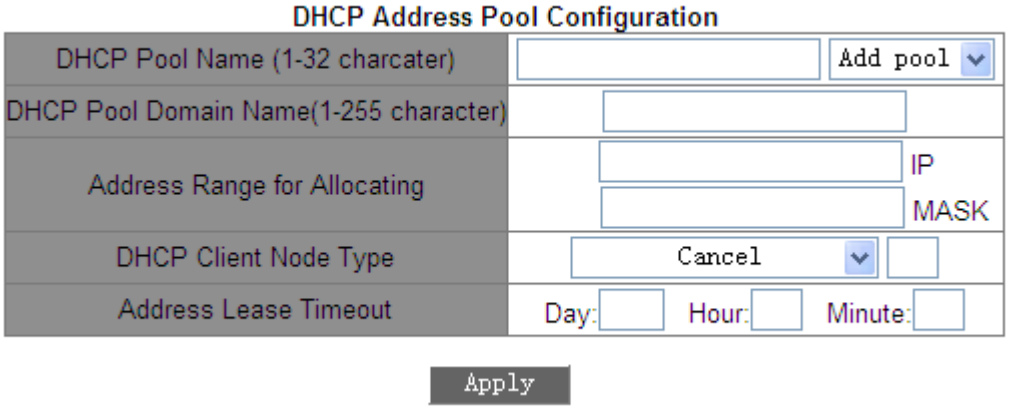


Figure 10-5 DHCP address pool configuration

10.6.1.2 Client's default gateway configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→Client's Default Gateway Configuration to configure DHCP client default gateway, which is equivalent to CLI command in chapter 10.2.2.4

- ☞ DHCP pool name-- select a DHCP address pool
- ☞ Gateway-default gateway. IP address of default gateway and DHCP client IP address should be in a subnet segment. Switch supports max 8 gateway addresses. the first setting gateway address has

highest priority, so the priority of address1 is highest, second is address2, third one is address3

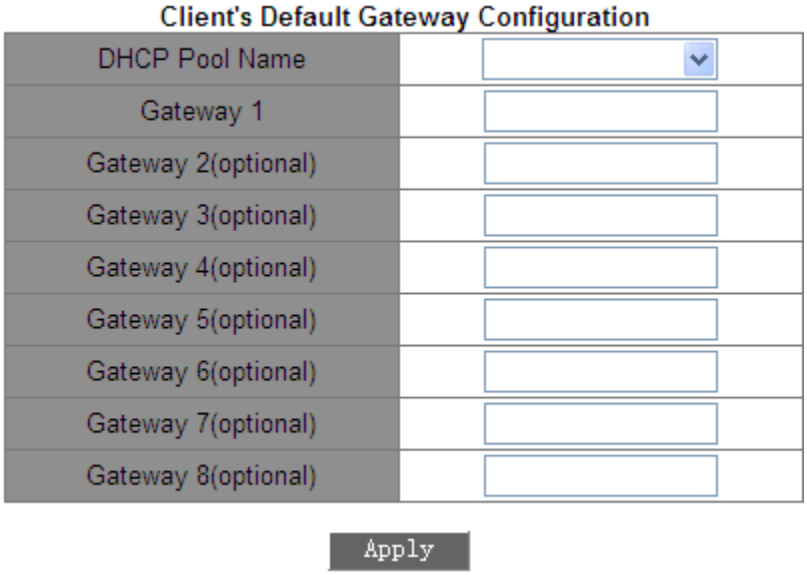


Figure 10-6 client default gateway configuration

10.6.1.3 Client DNS server configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→Client DNS server configuration to configure DNS server for DHCP client, which is equivalent to CLI command in chapter 10.2.2.5

- DHCP pool name-- select a DHCP address pool
- DNS server--DNS server, system supports max 8 DNS server addresses. The first setting DNS server address has highest priority, so the priority of address1 is highest, second is address2, third one is address3

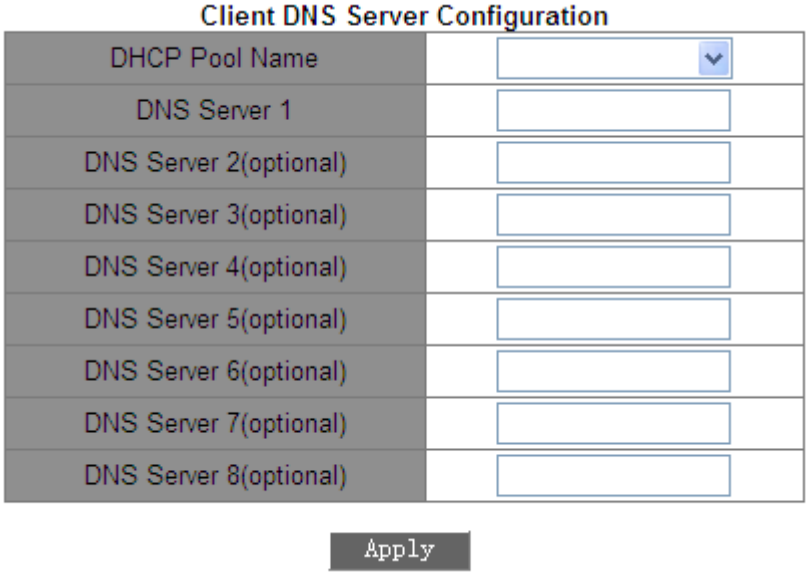


Figure 10-7 DHCP client DNS server configuration

10.6.1.4 Client WINS server configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→Client WINS server configuration to configure Wins server address, which is equivalent to CLI command in

chapter 10.2.2.14

- ☞ DHCP pool name-- select a DHCP address pool
- ☞ WINS server-- WINS server, system supports max 8 WINS server addresses. The first setting WINS server address has highest priority, so the priority of address1 is highest, second is address2, third one is address3

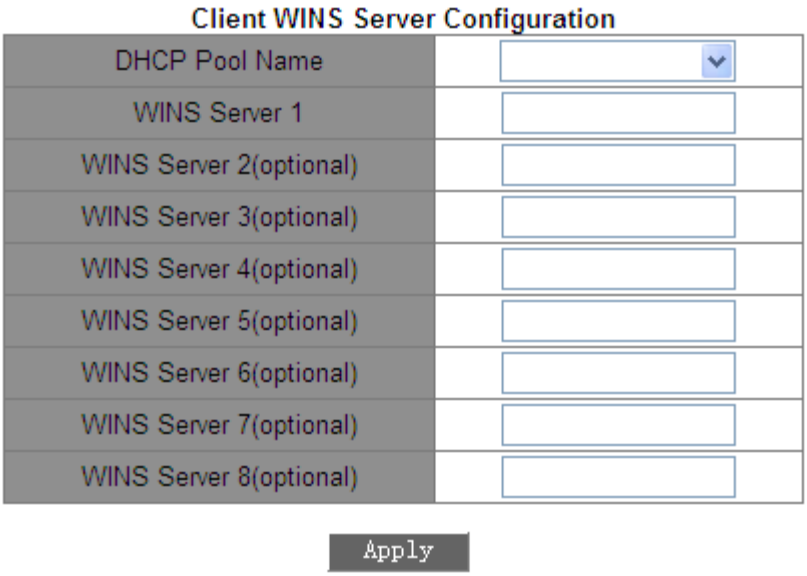


Figure 10-8 DHCP client Wins server configuration

10.6.1.5 DHCP file Server Address Configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→DHCP File Server Address Configuration

- ☞ DHCP pool name-- select a DHCP address pool
- ☞ DHCP client bootfile name (1-128 character)-- bootfile name which is equivalent to CLI command in chapter 10.2.2.1
- ☞ File server-- server address for client bootfile storage, which is equivalent to CLI command in chapter 10.2.2.17

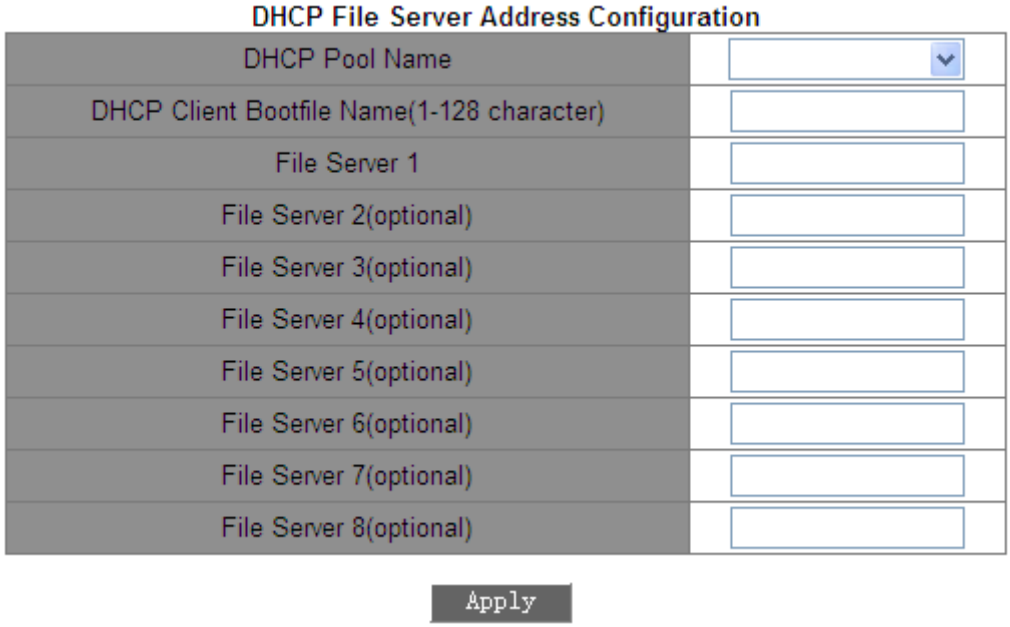


Figure 10-9 file server address configuration

10.6.1.6 DHCP network parameter configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→DHCP Network Parameter Configuration

- DHCP pool name-- select a DHCP address pool
- Code (0-254)—network parameter code
- Network parameter value type-- setting netork parameter type: **ascii** means ASCII type string with max 255 characters; **hex** means hexadecimal value with max 510 characters and length must be an even number; **ip address** is IP address
- Network parameter value
- Operation type-- set or cancel network parameter values

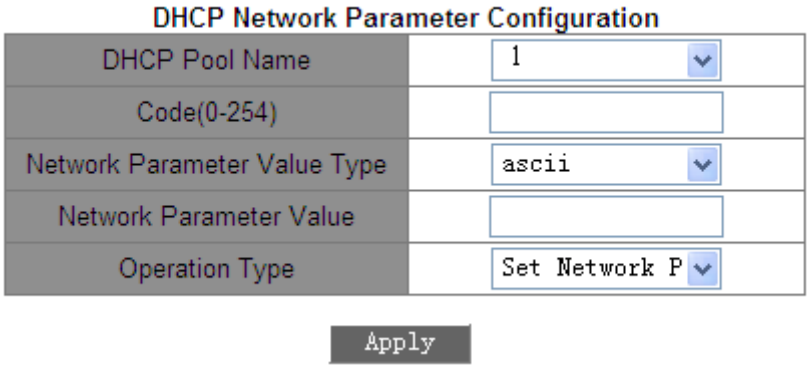


Figure 10-10 DHCP network parameter configuration

10.6.1.7 Manual address pool configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→Manual Address Pool Configuration to configure DHCP manual distribution address

- DHCP pool name-- select a DHCP address pool
- Hardware address--specify user hardware address, which is equivalent to CLI command in

chapter 10.2.2.7

- ☞ Client IP - distribute user IP address to specified client
- ☞ Client network mask- distribute user IP address mask to specified client, which equivalent to CLI command 10.2.2.8
- ☞ User name (1-255 character)- specify user unique identifier, which is equivalent to CLI command in chapter10.2.2.2

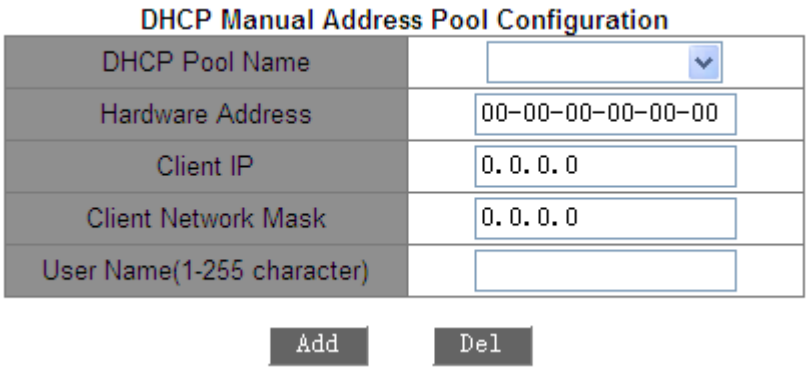


Figure 10-11 manual DHCP address pool configuration

10.6.1.8 Excluded address configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→Excluded Address Configuration to exclude addresses which are not used in dynamic distribution, which is equivalent to CLI command in chapter 10.2.2.10

- ☞ Starting address -- staringt IP address
- ☞ Ending address -- ending IP address
- ☞ Operation type- add or delete address not used in dynamic distribution in address pool

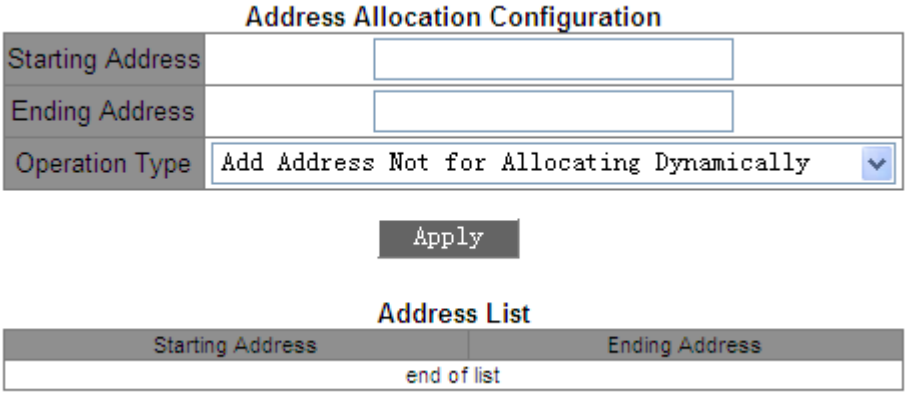


Figure 10-12 specify address not used in dynamic distribution

10.6.1.9 DHCP packet statistics

Click Device Advanced Configuration→DHCP Configuration→DHCP Server Configuration→DHCP packets statistics. It can show various DHCP data packets statistical information in DHCP server, which is equivalent to CLI command in chapter 10.5.1.3

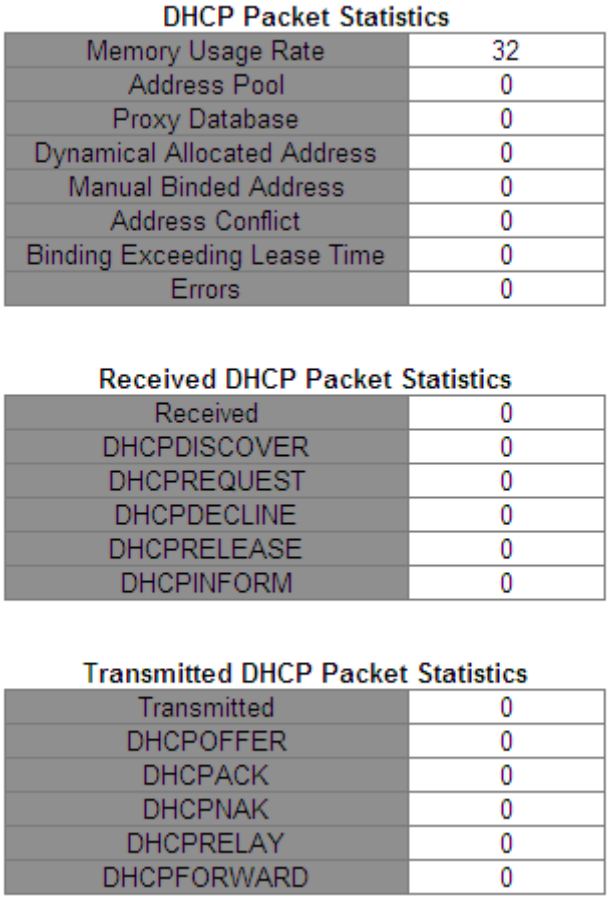


Figure 10-13 DHCP data packets statistical information

10.6.2 DHCP relay configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Relay Configuration to open the submenu of DHCP relay configuration. User can manage switch DHCP relay function

10.6.2.1 DHCP relay configuration

Click Device Advanced Configuration→DHCP Configuration→DHCP Relay Configuration→ DHCP relay configuration to configure switch DHCP relay function

Configure the port of DHCP forwarding UDP message, configure DUCP to relay forward UDP broadcast messages in the port, which is equivalent to CLI command in chapter 10.3.2.1

- Port-UDP port

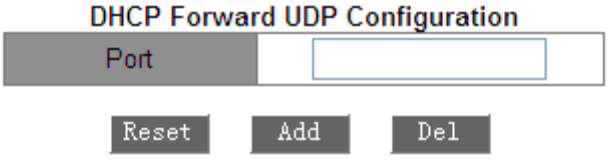


Figure 10-14 DHCP forwarding UDP message port

The destination address of DHCP relay forwarding udp message, which is equivalent to CLI command in chapter 10.3.2.2

- IP address--server address
- L3 interface

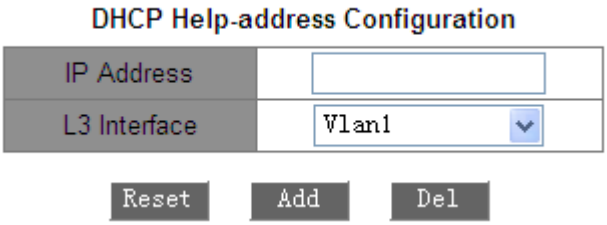


Figure 10-15 destination address of DHCP forwarding udp message

Configure relay forwarding policy to not forwarding DHCP message. If a layer 3 switch serve as DHCP relay, set the relay forwarding policy to not forwarding DHCP message, click "ApplY" to disable switch DHCP forwarding function, click "restore default value" to enable switch DHCP forwarding function. Switch forward DHCP at default.

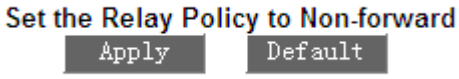


Figure 10-16 configure relay forwarding policy to not forwarding DHCP message

10.6.3 DHCP debugging

Click Device Advanced Configuration→DHCP Configuration→DHCP Debugging to open the submenu. It can show switch DHCP configuration and debugging information

10.6.3.1 Delete Binding Log

Click Device Advanced Configuration→DHCP Configuration→DHCP Debugging→Delete Binding Log to delete binding records of a specified IP address and its hardware address, or delete bing records of all IP addresses and their corresponding hardware addresses

Click yes in delete binding record; click "Apply" to delete binding records of all IP addresses and hardware addresses

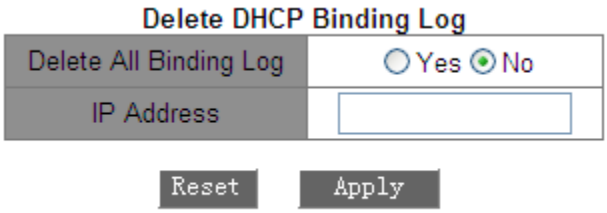


Figure 10-17 Delete DHCP binding records

10.6.3.2 Delete Conflict Log

Click Device Advanced Configuration→DHCP Configuration→DHCP Debugging→Delete Conflict Log to delete addresses which have conflict records in address conflict log

Click yes in delete conflict record; click "Apply" to delete addresses which have conflict records in address conflict log

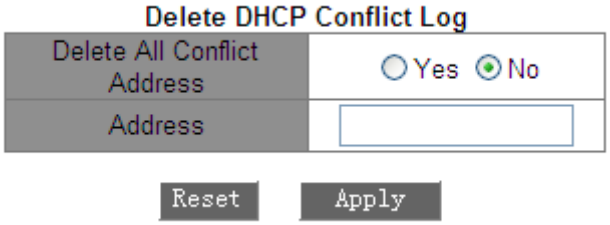


Figure 10-18 delete DHCP conflict record\

10.6.3.3 Delete DHCP server statistics log

Click Device Advanced Configuration→DHCP Configuration→DHCP Debugging→Delete DHCP server statistics log to clear DHCP server counter to zero

click "Apply" to delete DHCP server statistical record

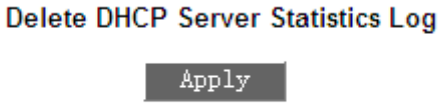


Figure 10-19 delete DHCP server statistical record

10.6.3.4 Show IP-MAC binding

Click Device Advanced Configuration→DHCP Configuration→DHCP Debugging→Show IP-MAC binding

Figure 10-20 show IP-MAC binding

10.6.3.5 Show Conflict-logging

Click Device Advanced Configuration→DHCP Configuration→DHCP Debugging→Show IP-MAC binding

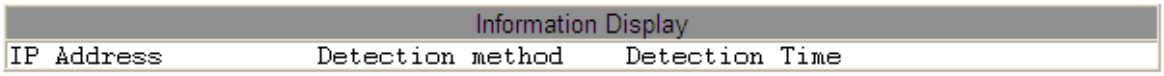


Figure 10-21 show conflict record log information

Chapter 11 QoS Configuration

11.1 QoS Introduction

QoS (Quality of Service) is an ability to offer better service in a network using various technologies to communicate with selected network. QoS provides stable and estimable data transmission services to meet program requirements. QoS is unable to create new bandwidth, but it can effectively manage network bandwidth according to application requirements and network management configuration.

11.2 QoS configuration

11.2.1 Task sequence of QOS configuration

1. Enable QoS function

Enable or disable QoS function in global mode. QoS function must be enabled in global mode at first, then it is able to configure other QoS command

2.Configure classmap

Create classmap. Classify data flow according to ACL，VLAN ID，IP Precedent，DSCP, then adopt different policy to different class data flow

3.Configure policymap

After data flow classification, it can create a policymap. Then it can correspond to classmap, and enter policy class map mode to adopt different policy to different data flow, such as bandwidth limit, lower priority, distribut new DSCP value, etc. We can define a set policy which can be used by many policy class maps in a policymap.

4.Apply QoS in port

Configure port trust mode or binding policy. Only policy is bound to specific port, the policy will take effect in the port

5.Configure egress queues working mode and weight

6. Configure QoS mapping relations

Configure mapping relationships from cos to dscp, dscp to cos, dscp mutation, ip precedent to dscp, policed-dscp

1. Enable QoS function

Command	Explanation
Global configuration mode	
mls qos **no mls qos**	Enable and disable QoS function

2. Configure classmap

command	explanation
Global configuration mode	
class-map <*class-map-name*> **no class-map <*class-map-name*>**	Create a class-map and enter class-map mode; no command is to delete specified class-map
match {access-group <*acl-index-or-name*> | ip dscp <*dscp-list*>| ip precedence <*ip-precedence-list*>| vlan <*vlan-list*>} **no match {access-group | ip dscp | ip precedence | vlan }**	Set match standard of class-map. Classify data flow according to ACL, DSCP, VLAN, priority, etc.

3. Configure policymap

Command	explanation
Global configuration mode	
policy-map <*policy-map-name*> **no policy-map <*policy-map-name*>**	Create a policy-map and enter policy-map mode; no command is to delete specify policy-map
class <*class-map-name*> **no class <*class-map-name*>**	After making a policy-map, correspond it to a classmap, enter policy glass map and start to adopt different policy to different data flow or distribute a new DSCP value; no command is to delete specified policy class map
set {ip dscp <*new-dscp*> | ip precedence <*new-precedence*>} **no set {ip dscp <*new-dscp*> | ip precedence <*new-precedence*>}**	distribute a new DSCP and IP Precedence values to classified flow; no command is to delete distribution
police <*rate-kbps*> <*burst-kbyte*> [exceed-action {drop | policed-dscp-transmit}] **no police <*rate-kbps*> <*burst-kbyte*> [exceed-action {drop | policed-dscp-transmit}]**	Configrue a policy to classified flow. Drop the data flow which exceed range or lower its priority; no command is to delete specified policy
mls qos aggregate-policer <*aggregate-policer-name*> <*rate-kbps*> <*burst-kbyte*> exceed-action {drop |policed-dscp-transmit} **no mls qos aggregate-policer <*aggregate-policer-name*>**	Define a aggregated policy. For out-of profile data flow, take different operation, such as drop or lower priority. This policy can be used by many policy calss map in a policy map
police aggregate <*aggregate-policer-name*> **no police aggregate <*aggregate-policer-name*>**	use a aggregated policy in classified flow; no command is to delete specified aggregated policy

4. Apply QoS in port

Command	explanation
Interface configuration mode	
mls qos trust [cos [pass-through-dscp]|dscp [pass-through-cos]|ip-precedence [pass-through cos]|port priority <*cos*>] **no mls qos trust**	Configure trust state in switch port; no command is forbid current trust state of switch port
mls qos cos {<*default-cos*> } **no mls qos cos**	Configure switch port default CoS value; no command is to restore default configuration
service-policy {input <*policy-map-name*> | output <*policy-map-name*>} **no service-policy {input <*policy-map-name*> | output <*policy-map-name*>}**	Apply a policy map in the port; no command is to delete a specified policy map used in switch port

mls qos dscp-mutation <*dscp-mutation-name*> **no mls qos dscp-mutation <*dscp-mutation-name*>**	Apply DSCP mutation mapping in the port; no command is to restore default value

5. Configure Queue-out working mode and weight

Command	explanation
Interface configuration	
wrr-queue bandwidth <*weight1 weight2 weight3 weight4 weight5 weight6 weight7 weight8*> **no wrr-queue bandwidth**	Configure WRR weight of switch specific port queue out; no command is to restore default value.
priority-queue out **no priority-queue out**	Configure working mode of queue out to pq; no command is to restore wrr queue ou working mode
Global configuration mode	
wrr-queue cos-map <*queue-id*> <*cos1 … cos8*> **no wrr-queue cos-map [<*queue-id*>]**	Set the mapping of CoS value to corresponding switch port queue out; no command is to restore default value

6. Configure QoS mapping relationship

Command	explanation
Global configuration mode	
mls qos map {cos-dscp <*dscp1…dscp8*> / dscp-cos <*dscp-list*> to <*cos*> / dscp-mutation <*dscp-mutation-name*> <*in-dscp*> to <*out-dscp*> |ip-prec-dscp <*dscp1…dscp8*> / policed-dscp <*dscp-list*> to <*mark-down-dscp*>} **no mls qos map {cos-dscp | dscp-cos | dscp-mutation <*dscp-mutation-name*> | ip-prec-dscp | policed-dscp}**	Set CoS-to-DSCP mapping, DSCP-to-CoS mapping, DSCP-to-DSCP-mutation mapping, IP-precedence-to-DSCP mapping and policed-DSCP mapping; no command is to restore default mapping value

11.2.2 QoS configuration mode

11.2.2.1 mls qos

Command: **mls qos**

no mls qos

Function: enable QoS in global configuration; no command is to disable global QoS

Command mode: global configuration mode

Default: disable QoS

User guide: QoS provides 8 queues and process flow with 8 types of priorities. This function and flow function are mutually exclusive

Example: enable or disable QoS function

Switch(config)#mls qos enable

Switch(config)#no mls qos enable

11.2.2.2 class-map

Command: **class-map <*class-map-name*>**

no class-map <*class-map-name*>

Function: create a class-map and enter class-map mode. No commamd is to delete specified class-map
Parameter: ***<class-map-name>*** is the name of class map
Default: no class map
Command mode: global configuration mode
User guide: none
Example: create and delete a class-map named c1
Switch(config)#class-map c1
Switch(config-ClassMap)# exit
Switch(config)#no class-map c1

11.2.2.3 match

Command: **match {access-group <*acl-index-or-name*> | ip dscp <*dscp-list*>| ip precedence <*ip-precedence-list*>| vlan <*vlan-list*>}**

no match {access-group | ip dscp | ip precedence / vlan }

Function: set the matching standard in calss map; no command is to delete specified matching standard
Parameter: **access-group <*acl-index-or-name*>** match specified ACL table, parameter is ACL number and name; **ip dscp <*dscp-list*>** match specified DSCP value, parameter is a DSCP value list with max 8 DSCP values; **ip precedence <*ip-precedence-list*>** match specified IP priority value, parameter is a IP priority vaule list with max 8 IP priority values in a range of 0~7; **vlan <*vlan-list*>** match specified VLAN ID value, parameter is a VLAN ID list with max 8 VLAN ID.
Command mode: class-map configuration mode
User guide: set a matching standard in each class map. When match ACL, only permit rule can be set in ACL.
Example: create a class map with name c1 and set the galss rule of this class map to match IP Precedence message with 0, 1 priority.
Switch(config)#class-map c1
Switch(config-ClassMap)#match ip precedence 0 1
Switch(config-ClassMap)#exit

11.2.2.4 policy-map

Command: **policy-map <*policy-map-name*>**

no policy-map <*policy-map-name*>

Function: create a policy map and enter policy map mode; no command is to delete specified policy map
Parameter: ***<policy-map-name>*** is the name of policy map
Default: no policy map
Command mode: global configuration mode
User guide: enter policy map configuration mode and operate QoS class matching and identify, etc.
Example: create and delete a policy map with map p1
Switch(config)#policy-map p1
Switch(config-PolicyMap)#exit
Switch(config)#no policy-map p1

11.2.2.5 class

Command: **class <*class-map-name*>**

no class <*class-map-name*>

Function: correspond to a class map and enter policy class map mode; no command is to delete specified policy class map.
Parameter: ***< class-map-name >*** is the name of class map adopted by specified policy class map.
Default: no policy class map
Command mode: policy map configuration mode
User guide: before create a policy class map, a olicy map must be created first and enter policy map mode. In policy class map mode, it is able to execute classification and policy configuration to packet flow which is classified according to class map
Example: enter polcy calss map mode
Switch(config)#policy-map p1
Switch(config-PolicyMap)#class c1
Switch(config--Policy-Class)#exit

11.2.2.6 set

Command: **set {ip dscp <*new-dscp*> | ip precedence <*new-precedence*>}**
no set {ip dscp | ip precedence}
Function: distribute a new DSCP and IP Precedence value to calssified flow; no command is to delete distribution
Parameter: ***<new-dscp>*** is a new DSCP value, ***<new-precedence>*** is a new IP priority value
Deafult: no distribution
Commode mode: policy class map configuration mode
User guide: only classified flow which conforms to matching standard is able to be re-distributed new value
Example: set the vaule of IP Precedence in the messages which comply with c1 class rules to 3
Switch(config)#policy-map p1
Switch(config-PolicyMap)#class c1
Switch(config--Policy-Class)#set ip precedence 3
Switch(config--Policy-Class)#exit
Switch(config-PolicyMap)#exit

11.2.2.7 police

Command: **police <*rate-kbps*> <*burst-kbyte*> [exceed-action {drop | policed-dscp-transmit}]**
no police <*rate-kbps*> <*burst-kbyte*> [exceed-action {drop | policed-dscp-transmit}]
Function: configure a policy to classified flow; no command is to delete specified policy
Parameter: ***<rate-kbps>*** is the average baud rate of classified flow with the unit Kbit/s and a rang of 1000～10000000, ***<burst-kbyte>*** is the burst value of classified flow with the unit Kbyte and a range of 1～1000000, **exceed-action drop** means that when exceed specified speed, adopts drop packets policy, **exceed-action policed-dscp-transmit** means that when exceed specified speed, adopts mark down packet DSCP value policy according to policed-dscp
Default: no policy
Command mode: policy class map configuration mode
User guide: the range of ***<rate-kbps> <burst-kbyte>*** vaule is large. If configuration exceed the port actual speed, the policy map which used this policy won't be bound to switch port
Example: set the bandwidth of message which conforms to c1 class rule to 20M bit/s and burst value to 2M byte, and drop al messages which exceed this bandwidth
Switch(config)#policy-map p1

Switch(config-PolicyMap)#class c1
Switch(config--Policy-Class)#police 20000 2000 exceed-action drop
Switch(config--Policy-Class)#exit
Switch(config-PolicyMap)#exit

11.2.2.8 mls qos aggregate-policer

Comman: **mls qos aggregate-policer <*aggregate-policer-name*> <*rate-kbps*> <*burst-kbyte*> exceed-action {drop |policed-dscp-transmit}**

no mls qos aggregate-policer <*aggregate-policer-name*>

Function: define a aggregation policy which can be used by many policy class map in a policy map; no command is to delete specified aggregation policy.

Parameter: ***<aggregate-policer-name>*** is the name of aggregation policy; ***<rate-kbps>*** is average baud rate of flow after classification with the unit of kilobit/s and in a range of 1000～10000000; ***<burst-kbyte>*** is the flow burst value after classification with the unit of kilobyte in a range of 1～1000000; **exceed-action drop** means when exceed designated speed, adopt dropping packets policy; **exceed-action policed-dscp-transmit** means when exceed designated speed, adopt the policy of **mark down** packets DSCP values according to mapping relations of **policed-dscp**

Default: do not define aggregation policy

Command mode: global configuration mode

User guide: if a aggregation policy is adpopted by a policy map, it can be directly deleted; we must firstly use **no police aggregate <*aggregate-policer-name*>** command to cancel the application of this aggregation policy in its corresponding policy map, then it is able to delete this aggregation policy by **no mls qos aggregate-policer <*aggregate-policer-name*>** command in global mode

Example: create a aggregation policy with the name of agg1. The definition of this aggregation policy is to set message bandwidth to 20M bit/s and burst value to 2M bytes. all message exceeding this bandwidth will be dropped

Switch(config)#mls qos aggregate-policer agg1 20000 2000 exceed-action drop

11.2.2.9 police aggregate

Command: **police aggregate <*aggregate-policer-name*>**

no police aggregate <*aggregate-policer-name*>

Function: apply a aggregation policy in classified flow; no command is to delete designated aggregation policy

Parameter: ***<aggregate-policer-name>*** is the name of aggregation policy

Default: do not define aggregation policy

Command mode: policy class map configuration mode

User guide: use a aggregation policy in different policy class maps

Example: apply aggregation policy agg1 in the message which conforms to c1 class rule

Switch(config)#policy-map p1
Switch(config-PolicyMap)#class c1
Switch(config--Policy-Class)#police aggregate agg1
Switch(config--Policy-Class)#exit
Switch(config-PolicyMap)#exit

11.2.2.10 mls qos trust

Command: **mls qos trust [cos [pass-through-dscp]|dscp [pass-through-cos]| ip-precedence [pass-through-cos] |port priority <*cos*>]**

[no] mls qos trust

Function:configure switch port trust state; no command is to forbid current trust state of switch port

Parameter: **cos** is to configure port trust CoS value; **cos pass-through-dscp** is to configure port trust CoS value, but do not change packet DSCP value; **dscp** is to configure port trust DSCP value; **dscp pass-through-cos** is to configure port trust DSCP value, but do not change packet CoS value; **ip-precedence** is to configure port trust IP priority; **ip-precedence pass-through-cos** is to configure port trust IP priority, but do not change packet CoS value;

Is to distribute a priority to physical port which is not relevant to the priority which message carry; the priority of the message entering from this port is set to be this cos value which is not related to message carried priority, do not modufy this message

Default: do not trust any value

Command mode: interface configuration mode

User guide: fo the packets which has CoS value and DSCP value, if do not wish the untrusted value is modified after classification, use keyword **pass-through** to protect it.

Example: configure trust cos value in port ethernet 1/1 which is to classify message according to cos value and do not change message DSCP value

Switch(config)#interface ethernet 1/1

Switch(Config-Ethernet1/1)#mls qos trust cos pass-through-dscp

11.2.2.11 mls qos cos

Command: **mls qos cos {*<default-cos>* }**

no mls qos cos

Function: configure default cos value of switch port; no command is to restore default configuration

Parameter: ***<default-cos>*** is the default value of switch port in a rnge of 0~7

Default: 0

Command mode: interface configuration mode

User guide:

Example: set default cos value of ethernet 1/1 to 5 which is that if the message entering from this port do not carry cos value, it will be distributed degfault cos vaule 5.

Switch(config)#interface ethernet 1/1

Switch(Config-Ethernet1/1)#mls qos cos 5

11.2.2.12 service-policy

Command: **service-policy {input <*policy-map-name*> | output <*policy-map-name*>}**

no service-policy {input <*policy-map-name*> | output <*policy-map-name*>}

Function: apply a policy map in switch port; no command is to delete a designated policy map which is applied in switch port

Parameter: **input <*policy-map-name*>** is to apply a policy map with designated name to input side of switch port; **output <*policy-map-name*>** is to apply a policy map with designated name to output side of switch port

Default: default port does not bind policy map

Command mode: interface configuration mode

User guide: configure port trust state and policy map applied in port are mutually exclusive; new configuration will cover fomer configuration; only one policy map can be applied in a direction of each port; at present, output policy map is not supported in the outputside of port

Example: bind policy p1 in the input side of port ethernet 1/1

Switch(config)#interface ethernet 1/1
Switch(Config-Ethernet1/1)# service-policy input p1

11.2.2.13 mls qos dscp-mutation

Command: **mls qos dscp-mutation <*dscp-mutation-name*>**

no mls qos dscp-mutation <*dscp-mutation-name*>

Function: apply DSCP mutation mapping in switch port; no command is to restore default value of DSCP mutation mapping

Parameter: ***<dscp-mutation-name>*** is the name of DSCP mutation mapping

Default: there is not DSCP mutation mapping

Command mode: interface configuration mode

User guide: configure DSCP mutation mapping in switch port which will take effect when port trust state is set to be trust DSCP; use DSCP mutation mapping to make designated DSCP value be directly mutated new DSCP value with the need of class and policy; DSCP mutation mapping only take effect to this port; and current trust DSCP is for the DSCP value before DSCP mutation

Example: configure trust DSCP in ethernet 1/1 and adopts DSCP mutation mapping of mu1

Switch(config)#interface ethernet 1/1

Switch(Config-Ethernet1/1)#mls qos trust dscp pass-through cos

Switch(Config-Ethernet1/1)#mls qos dscp-mutation mu1

11.2.2.14 wrr-queue bandwidth

Command: **wrr-queue bandwidth *<weight1 weight2 weight3 weight4 weight5 weight6 weight7 weight8>***

no wrr-queue bandwidth

Function: set WRR weight of switch port egress queues; no comman is to restore default value

Parameter: ***<weight1 weight2 weight3 weight4 weight5 weight6 weight7 weight8>*** is WRR weight in a range of 0~15

Default: default weight 1 to weight 8 is 1 to 8

Command mode: interface configuration mode

User guide: the absolute value of WRR weight is meaning less; WRR distribute bandwidth by the ratio of 8 weight values; if it is set 0, this queue has highest priority

Example: set the bandwidth ratio of 8 egeress queues to 1:1:2:2:4:4:8:8

Switch(Config-Ethernet1/1)#wrr-queue bandwidth 1 1 2 2 4 4 8 8

11.2.2.15 qos priority-queue out

Command: **priority-queue out**

no priority-queue out

Function: configure queue out mode; no command is to restore default value and the weight of egress interface queue also restore to default value

Parameter: none

Default:non priority-queue mode

Command mode: interface configuration mode

Uing guide: after adopting queue out mode of priority-queue, do not adopt WRR algorithm to send message, but wait until messages in current queuesare completely transmitted, then start sending the nessages in next queue

Example: set queue out working mode to priority-queue mode

Switch(Config-Ethernet1/1)#priority-queue out

11.2.2.16 wrr-queue cos-map

Command: **wrr-queue cos-map <*queue-id*> <*cos1 … cos8*>**

no wrr-queue cos-map [<*queue-id*>]

Function: set the CoS mapping of switch port egress queue; no command is to restore default value

Parameter: **<*queue-id*>** is egress queue ID in a range of 1~8; the max quantity of mapping to egress queue CoS values is 8 in a range of 0~7.

Default:

Default CoS-to-Egress-Queue Map when QoS is Enabled

CoS Value	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Queue Selected	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

Command mode: global configuration mode

User guide: when disable QoS, it is default mapping value

Example: map the message with with cos value of 2 or 3 to egress queue 1

Switch(config)#wrr-queue cos-map 1 2 3

11.2.2.17 mls qos map

Command: **mls qos map {cos-dscp <*dscp1…dscp8*> / dscp-cos <*dscp-list*> to <*cos*> / dscp-mutation <*dscp-mutation-name*> <*in-dscp*> to <*out-dscp*> |ip-prec-dscp <*dscp1…dscp8*> / policed-dscp <*dscp-list*> to <*mark-down-dscp*>}**

no mls qos map {cos-dscp | dscp-cos | dscp-mutation <*dscp-mutation-name*> | ip-prec-dscp | policed-dscp}

Function: configure **class of service(CoS)-to-Differentiated Services Code Point (DSCP)** mapping, **DSCP-to-CoS** mapping, **DSCP-to-DSCP-mutation** mapping, **IP-precedence-to-DSCP** mapping and **policed-DSCP** mapping; no command is to restore default mapping value.

Parameter: **cos-dscp <*dscp1…dscp8*>** define CoS value-to-DSCP value mapping, **<*dscp1…dscp8*>** are 8 DSCP values which respectively correspond to CoS value of 0~7, DSCP values are separated with "Space", the range of DSCP value is 0~63; **dscp-cos <*dscp-list*> to <*cos*>** define DSCP value to CoS value mapping, **<*dscp-list*>** is the list of DSCP values with max 3 DSCP values; **<*cos*>** is the corresponding CoS value of DSCP value in the list; **dscp-mutation <*dscp-mutation-name*> <*in-dscp*> to <*out-dscp*>** define DSCP value to DSCP value mutation mapping, **<*dscp-mutation-name*>** is the name of mutation mapping; **<*in-dscp*>** is ingress DSCP value with max 8 values and DSCP values are separated with "Space" and the range of DSCP values is 0~63; **<*out-dscp*>** is egress DSCP value, it has only one value. 8 values which are defined in ingress DSCP will be changed to DSCP value; **ip-prec-dscp <*dscp1…dscp8*>** define the mutation from IP priority to DSCP value; **<*dscp1…dscp8*>** are 8 DSCP values which respectively correspond to IP priority values of 0~7 and DSCP values are separated with "Space", the range of DSCP value is 0~63; **policed-dscp <*dscp-list*> to <*mark-down-dscp*>** define DSCP mark down mapping, **<*mark-down-dscp*>** is the list of DSCP value with max 8 DSCP values, is the DSCP values after mark down

Default: default mapping values are as follows:

Default CoS-to-DSCP Map

CoS Value	0	1	2	3	4	5	6	7
DSCP Value	0	8	16	24	32	40	48	56

Default DSCP-to-CoS Map

DSCP Value	0–7	8–15	16–23	24–31	32–39	40–47	48–55	56–63
CoS Value	0	1	2	3	4	5	6	7

Default IP-Precedence-to-DSCP Map

IP Precedence Value	0	1	2	3	4	5	6	7
DSCP Value	0	8	16	24	32	40	48	56

dscp-mutation and **policed-dscp** are not configured at default

Command mode: global configuration mode

User guide: in **police** command, it is able to set the classified packets which exceed specified average speed and burst value to operate **mark down** process; **policed-dscp *<dscp-list>* to *<mark-down-dscp>*** command can **mark down** the DSCP values of these packets to new DSCP values

Example: change the default mapping values of ***CoS-to-DSCP*** from 0 8 16 24 32 40 48 56 to 0 1 2 3 4 5 6 7

Switch(config)#mls qos map cos-dscp 0 1 2 3 4 5 6 7

11.3 QoS example

Example 1:

Enable QoS function, change the weight of ethernet 1/1 egress queue to 1:1:2:2:4:4:8:8, configure to trust cos mode, but do not change DSCP value in message, and set the default cos value of this port to 5

Configuration steps are as follows:

SWITCH#CONFIG

Switch(config)#mls qos

Switch(config)#interface ethernet 1/1

Switch(config-Ethernet1/1)#wrr-queue bandwidth 1 1 2 2 4 4 8 8

Switch(config-Ethernet1/1)#mls qos trust cos pass-through dscp

Switch(config-Ethernet1/1)#mls qos cos 5

Configuration results:

Enable global QoS function, the ration of ethernet 1/1 egress bandwidth is 1:1:2:2:4:4:8:8 respectively. When the messages which enter from ethernet 1/1 has cos value, cos value 0-7 respectively correspond to egress queues 1, 2, 3, 4, 5, 6, 7, 8 according to cos value to egress queue mapping relations; in different priority queues, if entering messages do not carry cos value, set the cos value to 5; according to corresponding relations, put into priority queue 6; all messages passing through will not change its carried DSCP value

Example 2:

In port ethernet 1/2, set the bandwidth limit of message in segment 192.168.1.0 to 10M bit/s; burst value to 4M bytes. in this segment, the messages which exceed this bandwidth will all be dropped.

Configuration steps are as follows:

SWITCH#CONFIG

Switch(config)#access-list 1 permit 192.168.1.0 0.0.0.255

Switch(config)#mls qos

Switch(config)#class-map c1

Switch(config-ClassMap)#match access-group 1

Switch(config-ClassMap)# exit

Switch(config)#policy-map p1

Switch(config-PolicyMap)#class c1

Switch(config--Policy-Class)#police 10000 4000 exceed-action drop

Switch(config--Policy-Class)#exit

Switch(config-PolicyMap)#exit
Switch(config)#interface ethernet 1/2
Switch(Config-Ethernet1/2)#service-policy input p1
Configuration results:
Firstly, set a ACL: match segment 192.168.1.0; enable QoS function; create a class-map:c1; match ACL1 in class-map, create s policy-map: p1; use c1 in p1; set corresponding policy to limit bandwidth peak; then use this policy-map in port ethernet 1/2. After configuration, the message bandwith in segment 192.168.1.0 at port ethernet 1/2 is limited to 10M bit/s and burst value is 4M bytes. in this bandwidth, message exceed this bandwidth will all be dropped.
Example 3:

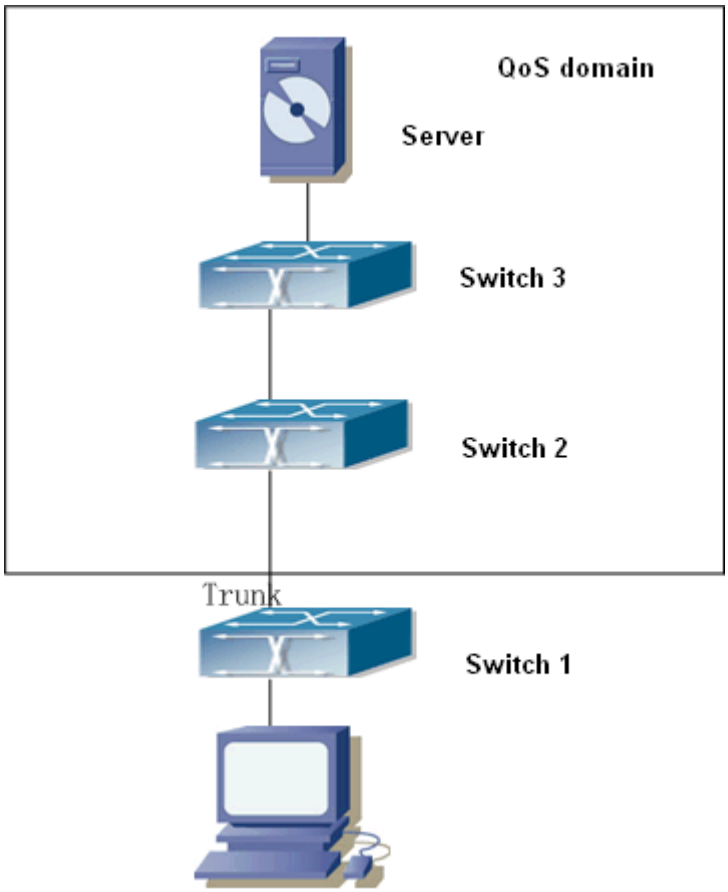


Figure 11-1 QoS typical topology

As above figure, form a QoS domain in the box; switch 1 classify different flows and distribute different cos priorities, such as in port ethernet 1/1, set cos priority of message to 5 in segment 192.168.1.0, and set the port connected with Switch 2 to trunk port; in switch 2, set trust cos priority of the port ethernet 1/1 connected with switch 1. So in QoS domain, messages with different priorities will flow in different queues, and distribute different different bandwidth
QoS configuration in switch 1:
SWITCH#CONFIG
Switch(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Switch(config)#mls qos
Switch(config)#class-map c1
Switch(config-ClassMap)#match access-group 1

Switch(config-ClassMap)# exit
Switch(config)#policy-map p1
Switch(config-PolicyMap)#class c1
Switch(config--Policy-Class)#set ip precedence 5
Switch(config--Policy-Class)#exit
Switch(config-PolicyMap)#exit
Switch(config)#interface ethernet 1/1
Switch(Config-Ethernet1/1)#service-policy input p1

QoS configuration in switch 2:
SWITCH#CONFIG
Switch(config)#mls qos
Switch(config)#interface ethernet 1/1
Switch(config-Ethernet1/1)#mls qos trust cos pass-through dscp

11.4 QoS troubleshooting help

11.4.1 QoS debugging and monitoring commands

11.4.1.1 show mls-qos

Command: **show mls-qos**
Function: show QoS global configuration information
Parameter: none
Default: none
Command mode: privilege user configuration mode
User guide: show the information that QoS is enabled or not.
Example:
Switch #show mls-qos
Qos is enabled

Showing contents	Explanation
Qos is enabled	Enable QoS function

11.4.1.2 show mls qos aggregate-policer

Command: **show mls qos aggregate-policer [<*aggregate-policer-name*>]**
Function: shw QoS aggregation policy configuration information
Parameter: ***<aggregate-policer-name>*** is the name of aggregation policy
Default: none
Command mode: privilege user configuration mode
User guide: none
Example:
Switch #show mls qos aggregate-policer policer1
aggregate-policer policer1 80000 80 exceed-action drop
Not used by any policy map

Showing contents	explanation
aggregate-policer policer1 80000 80 exceed-action drop	the aggregation policy configuration
Not used by any policy map	the numer of times this aggregation policy is used

11.4.1.3 show mls qos interface

Command: **show mls qos interface [<*interface-id*>] [buffers | policers | queueing | statistics]**

Function: shoe QoS configuration information in switch port

Parameter: <***interface-id***> is switch port ID; **buffers** is port queue buffer configuration; **policers** is port policy configuration; **queueing** is port queue configuration; **statistics** are the numbers of packets which pass through in the bandwidth limit binding policy and out of the bandwidth limit

Default: none

Command mode: privilege user configuration mode

User guide: only after configuring ingress interface policy are there statistical information

Example:

Switch #show mls qos interface ethernet 1/2

Ethernet1/2

default cos:0

DSCP Mutation Map: Default DSCP Mutation Map

Attached policy-map for Ingress: p1

Showing contents	Explanation
Ethernet1/2	port name
default cos:0	default cos value of port
DSCP Mutation Map: Default DSCP Mutation Map	DSCP mapping table name of port
Attached policy-map for Ingress: p1	port binding policy name

Switch # show mls qos interface buffers ethernet 1/2

Ethernet1/2

packet number of 8 queue:

0x200 0x200 0x200 0x200 0x200 0x200 0x200 0x200

Showing contents	explanation
Cos-queue map:	CoS to queue mapping relations
packet number of 8 queue: 0x200 0x200 0x200 0x200 0x200 0x200 0x200 0x200	8 egress queues of port, the number of userful messages, fixed configuration, unchangable

Switch # show mls qos interface queueing ethernet 1/2

SWITCH#show mls qos int queue e 1/2

Cos-queue map:

Cos 0 1 2 3 4 5 6 7

Queue 1 2 3 4 5 6 7 8

Queue and weight type:

Port q1 q2 q3 q4 q5 q6 q7 q8 QType

2 1 2 3 4 5 6 7 8 WFQ

Showing contents	explanation
Cos-queue map:	CoS to queue mapping relations
Queue and weight type:	queue to weight mapping relations
QType	WFQ or PQ egress queue mode

Switch # show mls qos interface policers ethernet 1/2

Ethernet1/2

Attached policy-map for Ingress: p1

Showing contents	explanation
Cos-queue map:	CoS to queue mapping relations
Ethernet1/2	port name
Attached policy-map for Ingress: p1	Port binding policy-map

Switch # show mls qos interface statistics ethernet 1/2

Device: Ethernet1/2

Classmap classified in-profile out-profile (in packets)

c1 0 0 0

Showing contents	explanation
Cos-queue map:	CoS to queue mapping relations
Ethernet1/2	port name
ClassMap	ClassMap name
classified	the total amount of data messages matching this ClassMap
in-profile	the total amount of data messages matching in-profile of this ClassMap
out-profile	the total amount of data messages matching out-profile of this ClassMap

11.4.1.4 show mls qos maps

Command: **show mls qos maps [cos-dscp | dscp-cos | dscp-mutation <*dscp-mutation-name*> | ip-prec-dscp | policed-dscp]**

Function: show QoS mapping configuration information

Parameter: **cos-dscp** is CoS to DSCP mapping; **dscp-cos** is DSCP to CoS mapping; **dscp-mutation <*dscp-mutation-name*>** is DSCP to DSCP mutation mapping; **<*dscp-mutation-name*>** is the name of mutation mapping; **ip-prec-dscp** is the mutation from IP priority to DSCP; **policed-dscp** is DSCP mark down mapping

Default: none

Command mode: privilege user configuration mode

User guide:

Example:

Switch # show mls qos map

Cos-dscp map:

cos: 0 1 2 3 4 5 6 7

---

dscp: 0 8 16 24 32 40 48 56

IpPrecedence-dscp map:

ipprec: 0 1 2 3 4 5 6 7

---

dscp: 0 8 16 24 32 40 48 56

Dscp-cos map:

d1 : d2	0	1	2	3	4	5	6	7	8	9
0:	0	0	0	0	0	0	0	0	1	1
1:	1	1	1	1	1	1	2	2	2	2
2:	2	2	2	2	3	3	3	3	3	3
3:	3	3	4	4	4	4	4	4	4	4
4:	5	5	5	5	5	5	5	5	6	6
5:	6	6	6	6	6	6	7	7	7	7
6:	7	7	7	7						

Policed-dscp map:

d1 : d2	0	1	2	3	4	5	6	7	8	9
0:	0	1	2	3	4	5	6	7	8	9
1:	10	11	12	13	14	15	16	17	18	19
2:	20	21	22	23	24	25	26	27	28	29
3:	30	31	32	33	34	35	36	37	38	39
4:	40	41	42	43	44	45	46	47	48	49
5:	50	51	52	53	54	55	56	57	58	59
6:	60	61	62	63						

11.4.1.5 show class-map

Command: **show class-map [<*class-map-name*>]**

Function: show information of QoS class map

Parameter: **<*class-map-name*>** is the name of class map

Default: none

Command mode: privilege user configuration mode

User guide: show information of all configured class-maps or designated class-map

Example:

Switch # show class-map

Class map name:c1

Match acl name:1

Showing contents	explanation
Class map name:c1	the name of ClassMap
Match acl name:1	class rules of ClassMap

11.4.1.6 show policy-map

Command: **show policy-map [<*policy-map-name*>]**

Function: show information of QoS policy map

Parameter: **<*policy-map-name*>** is the name of policy map

Default: none

Command mode: privilege user configuration mode

User guide: show information of all configured policy-maps or designated policy-map

Example:

Switch # show policy -map

Policy Map p1

Class Map name: c1

police 16000000 2000 exceed-action drop

Showing contents	explanation
Policy Map p1	the name of policy-map
Class map name:c1	used ClassMap name
police 16000000 8000 exceed-action drop	used policy

11.4.2 QoS troubleshooting help

- By default, switch disable QoS, set 8 pieces of transmitting queues, queue 1 forward normal data packets, other queues send some important control messages (such as BPDU)
- After enable global QoS, all switch ports enable QoS function, set 8 pieces of transmitting queues. The default CoS value of port is 0; port is in not Trusted state; default weights of priority queues are 1, 2, 3, 4, 5, 6, 7, 8 respectively; all QoS Maps adopt default values
- By default, CoS value 7 is mapped to queue 8 with highest priority, generally it is reserved to some protocol messages; it is recommended that users do not change CoS 7to queue 8 mapping relationships at will; generally, default CoS value of port does not set to be 7
- At present, only support policy map binding at ingress, egress is unsupoorted
- With the limit of hardware resources, if policy can't be configured because it is too complex, system will inform user related information

11.5 WEB Management

Click Device Advanced Configuration→QoS configuration to open the submenu of QoS configuration, which include 6 parts

Enable QoS

Calss-map Cofiguration

Policy-map Configuration

Apply QoS to port

Egress-queue Configuration

QoS Mapping Configuration

11.5.1 Enable QoS

Click Device Advanced Configuration→QoS configuration→Enable QoS to open configuration menu, which is equivalent with CLI command is chapter 11.2.2.1

Explanation:

QoS status—Open/close

Select "Open" , click "apply" to enable QoS

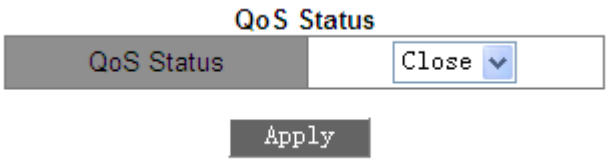


Figure 11-2 enable switch QoS

11.5.2 Calss-map Cofiguration

Click Device Advanced Configuration→QoS configuration→Calss-map Cofiguration to open configuration menu, which include

Add/remove class-map

Class-map configuration

11.5.2.1 Add /remove class-map

Click Add/remove calss-map to enter configuration page, which is equivalent with CLI command is chapter 11.2.2.2

Exaplanation:

Class-map name

Operation type—create or delete class table

Enter the name of class map, select "Create Class Table", click "Apply" to add class map

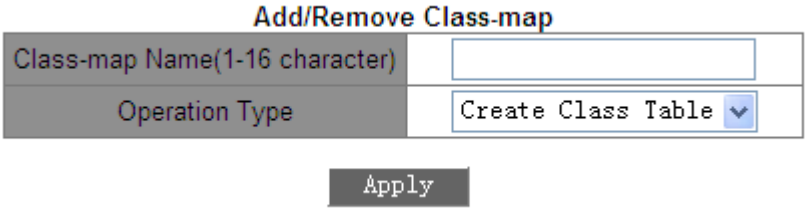


Figure 11-3 add/delete class map

11.5.2.2 Class-map configuration

Click class-map configuration to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.3

Explanations:

Class-map name

Match Action-- including

Access-group first valid—to match designated ACL list. The parameter is ACL number or name; first valid means Match value 0 is effective

Ip dscp- to match desinated DSCP value; the parameter is DSCP value list

Ip precedence—to match designated IP priority value; the parameter is IP priority value list

Vlan—to match designated VLAN ID; the parameter is a VLAN ID list

Match Value 1-8- match parameter vlue list. When match ACL, input ACL value in Match value 0

Operation type—set or delete

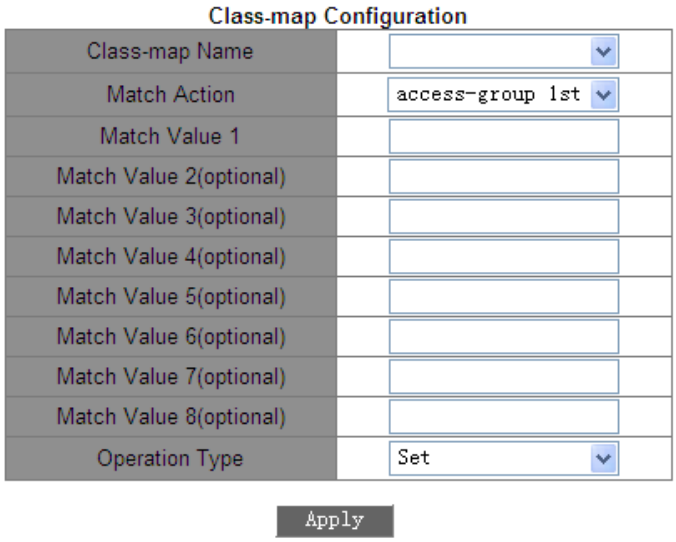


Figure 11-4 class map configuration

11.5.3 Policy map configuration

Click Policy-map configuration to open configuration menu, including 5 items

Add/Remove policy-map

Policy-map Priority Configuration

Policy-map bandwidth configuration

Add/Remove Aggregate Policy

Apply aggregate policy

11.5.3.1 Add/Remove policy-map

Click Add/Remove policy map to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.4

Explanation:

Policy-map name

Operation type: add or delete policy table

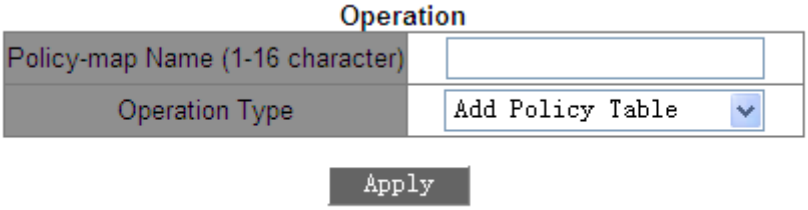


Figure 11-5 add or delete policy map

11.5.3.2 Policy map priority configuration

Click policy map priority configuration to enter configuration page which is equivalent with CLI command 11.2.2.6

Explanation:

Policy map name

Class map name

Priority type: DSCP value or IP precedence value

Priority value

Operation type: set or delete

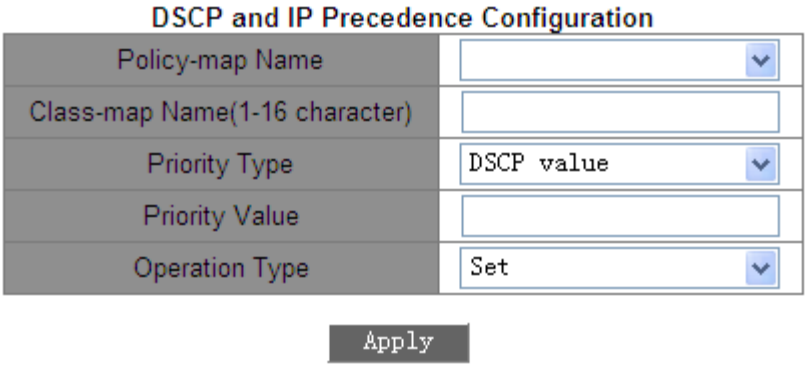


Figure 11-6 policy map priority configuration

11.5.3.3 Policy map bandwidth configuration

Click policy map bandwidth configuration to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.7

Explanation:

Policy map name

Class map name

Rate- the average baud rate of flow after classification with the unit of kilobit/s

Normal burst—the burst value of flow after classification with the unit of kilobyte

Exceed Action-- when exceed desingnated speed, adopt dropping packet policy; according to the mapping relationship of police-dscp, adopt the policy of reduce DSCP value of priority packets

Operation type-- set or delete

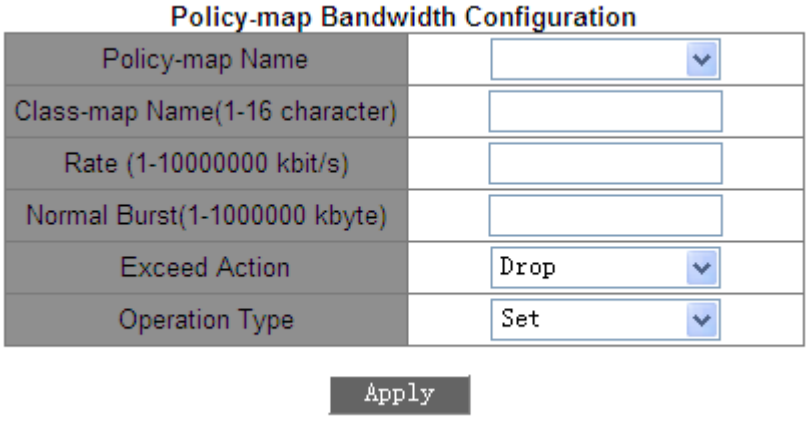


Figure 11-7 policy map bandwidth configuration

11.5.3.4 Add/Remove Aggregate Policy

Click Add/Remove Aggregate Policy to enter configuration page, which is quivalent with CLI command in chapter 11.2.2.8

Explanation:

Aggregate policy name

Rate-- the average baud rate of flow after classification

Burst-- the burst value of flow after classification

Exceed-action-- the policy is adopted when exceed designated speed, including

Drop—dropping packets

Policed-dscp-transmit—according to the mapping relations of policed-dscp, adopt the policy of mark down packet DSCP value

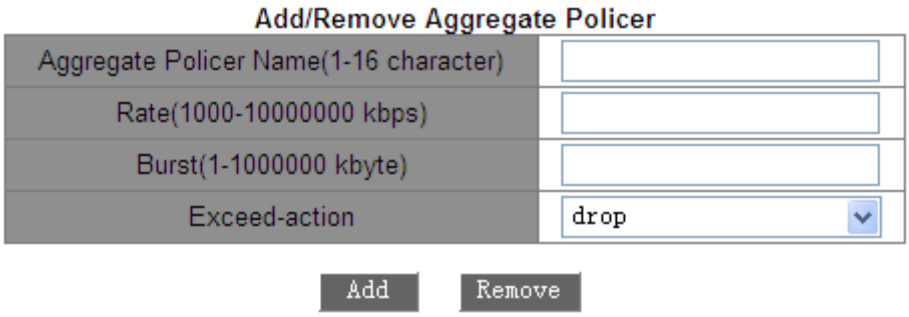


Figure 11-8 define a aggregation policy

11.5.3.5 Apply aggregate policy

Click Apply aggregate policy to enter configuration page which is equivalent with CLI command in chapter 11.2.2.9

Explanation:

Aggregation policy name

Policy map name

Class map name

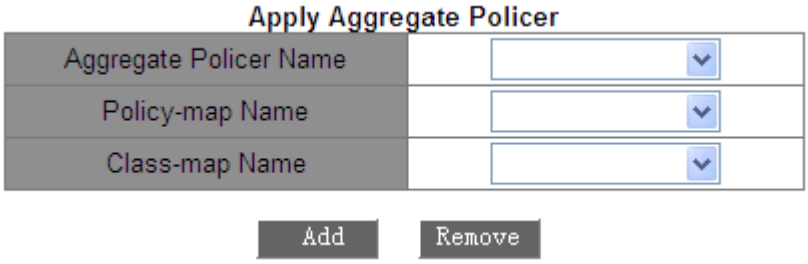


Figure 11-9 apply a aggregation policy

11.5.4 Apply QoS to port

Click Apply QoS to port to open configuration menu, including

Port trust mode configuration

Port default CoS configuration

Apply policy map to port

Apply DSCP mutation mapping

11.5.4.1 Port Trust Mode Configuration

Click Port Trust Moe Configuration to enter configuaration mode, which is equivalent with CLI command in chapter 11.2.2.10

Explanation:

Port-- port name

Port trust status-- including

cos, cos and pass-through-dcsp,

dcsp, dcsp and pass-through-cos,

ip-precedence, ip-pre and pass-through-cos

(ort priority (0-7)

Reset-- reset all parameters in this page to their initial values, which won't change configuration

Default-- restore default configuration, which change configuration

Choose one from the parameters of trust status and priority

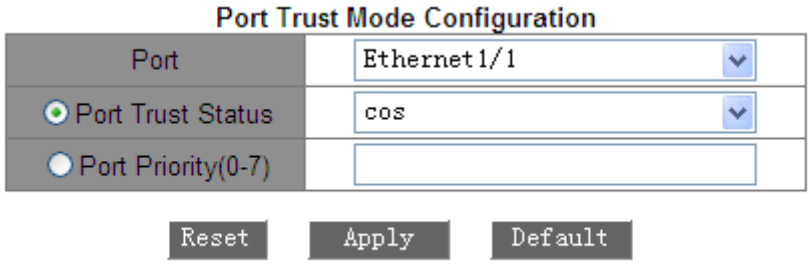


Figure 11-10 configure port trust mode

11.5.4.2 Port default CoS Configuration

Click Port Default Cos Configuration to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.11

Explanation:

Port—port name

Default CoS value (0-7)

Reset--- reset all parameters in this page to their initial values, which won't change configuration

Default-- restore default configuration, which change configuration

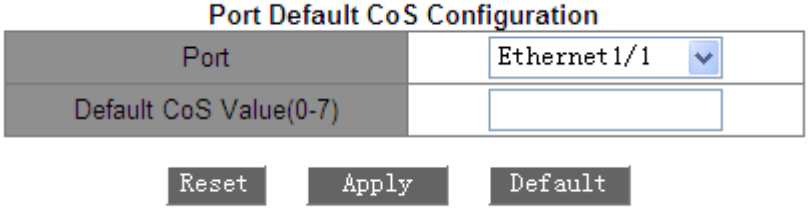


Figure 11-11 configure default CoS value of switch port

11.5.4.3 Apply policy map to port

Click Apply Policy-map to Port to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.12

Explanation:

Port—port name

Policy-map name

Port Direction—input or output

Operation- - set or delete

Reset-- reset all parameters in this page to their initial values, which won't change configuration

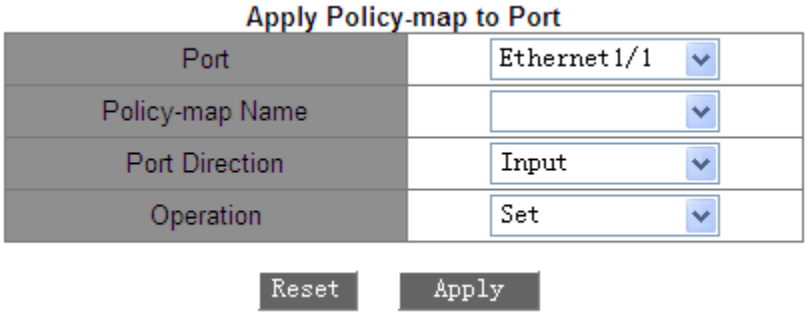


Figure 11-12 apply a policy map to port

11.5.4.4 Apply DSCP mutation mapping

Click Apply DSCP Mutation Mapping to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.13

Explanation:

Port Name

DSCP mutation name (1-16 characters)- the name of mutation mapping

Operation- set or delete

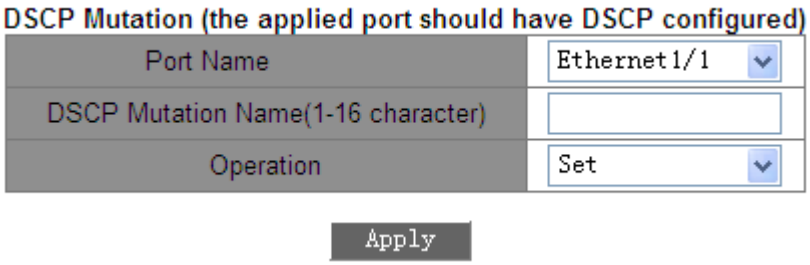


Figure 11-13 apply DSCP mutation mapping to port

11.5.5. Egress-queue configuration

Click Egress-queue Configuration to open configuration menu, including

Egress- queue Wrr Weight Configuration

Egress- queue Work Mode Configuration

Mapping CoS Values to Egress Queue

11.5.5.1 Egress- queue Wrr Weight Configuration

Click Egress- queue Wrr Weight Configuration to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.14

Explanation:

Weight for queue 0-7—the weights of 8 queues

Operation- set or delete

Reset-- reset all parameters in this page to their initial values, which won't change configuration

To configure weight, selet port name, input weight of each queue, select "set", click "apply"

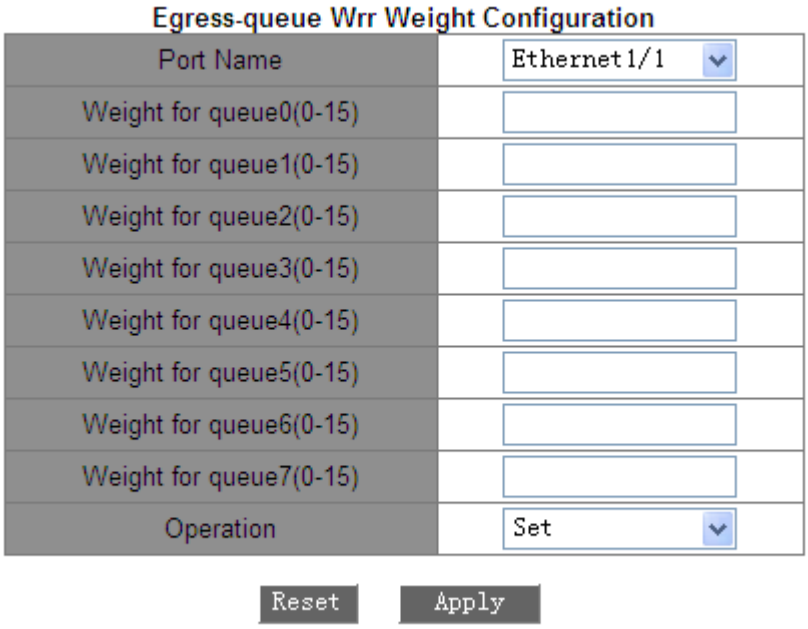


Figure 11-14 configure out queue WRR weight

11.5.5.2 Egress- queue Work Mode Configuration

Click Egress- queue Work Mode Configuration to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.15

Explanation:

Port name

Reset-- reset all parameters in this page to their initial values, which won't change configuration

restore default value- restore default configuration, which change configuration

To configure port queue out mode to be priority-queue, select port, click "Apply"

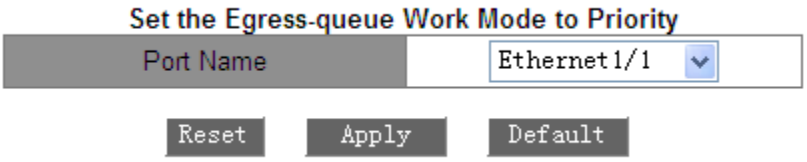


Figure 11-15 configure queue out mode

11.5.5.3 Mapping CoS Values to Egress Queue

Click c Mapping CoS Values to Egress Queue to enter configuration page, which is equivalent with CLI command in chapter 11.2.2.16

Explanation:

Queue ID-- ID of egress queue

CoS value-- CoS value of mapping to egress queue, which support 8 values

Reset- - reset all parameters in this page to their initial values, which won't change configuration

Default-- restore default configuration, which change configuration

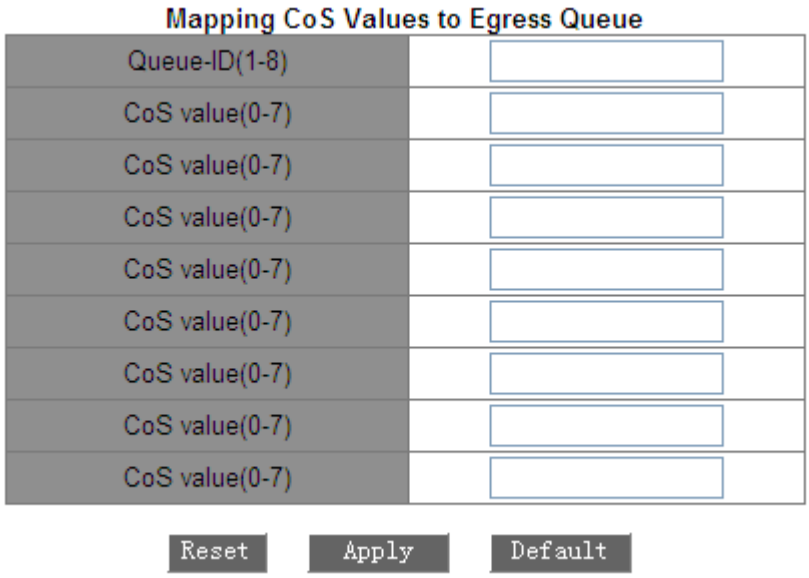


Figure 11-16 configure CoS to corresponding switch port egress queue mapping

11.5.6 QoS mapping configuration

Click QoS Mapping Configuration to expand configuration menu, including

CoS-to-DSCP mapping

DSCP-to-CoS mapping

DSCP mutation mapping—define DSCP-to-DSCP mutation mapping

IP-Precedence-to-DSCP mapping

DSCP mark down mapping

It is equivalent with CLI command in chapter 11.2.2.17

11.5.6.1 CoS-to-DSCP mapping

Click CoS-to-DSCP mapping to enter configuration page

Explanation:

Operation type-- set or delete

CoS value (0-7)

DSCP value (0-63)—show current mapping relationship; 8 DSCP values correspond to CoS value 0-7

To map CoS value 2 to DSCP value 20, select set in operation type, enter 2 in corresponding DSCP of CoS value 2

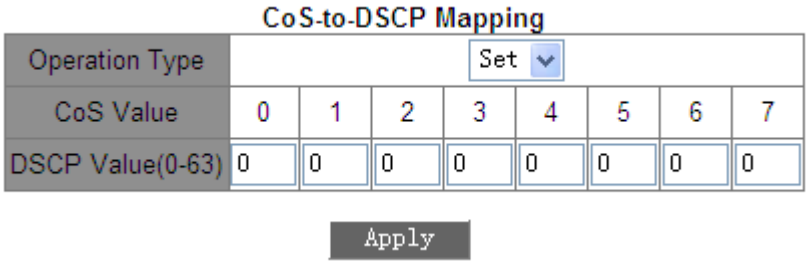


Figure 11-17 CoS-to-DSCP mapping

11.5.6.2 DSCP-to-CoS mapping

Click DSCP-to-CoS mapping to enter configuration page

Explanation:
Operation type- set or delete
DSCP value 1-8
CoS value—corresponding CoS value of DSCP value

To map DSCP value 20 to CoS value2, and to DSCP value 20, enter 20 in DSCP1, 2 in CoS value, select set in operation type, click apply

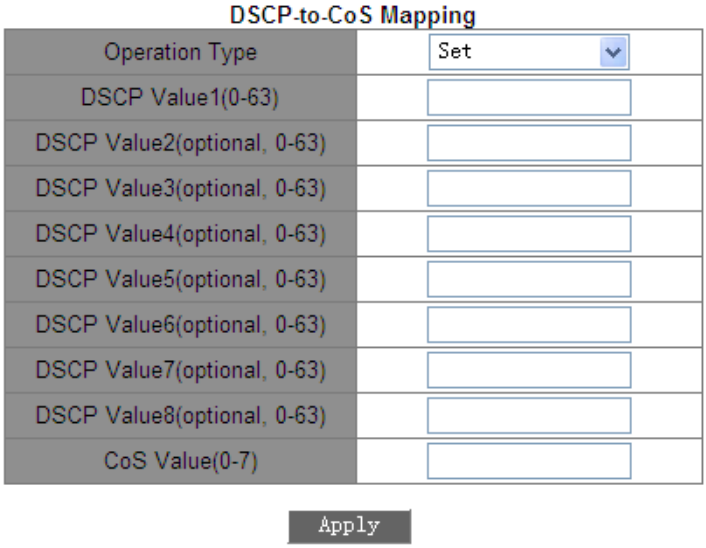


Figure 11-18 DSCP-to-CoS mapping

11.5.6.3 define DSCP-to-DSCP mutation mapping

Click DSCP mutation mapping to enter configuration page
Explanation:
Operation type-- set or delete
DSCP mutation name
Out-DSCP value
In-DSCP value (1-8)

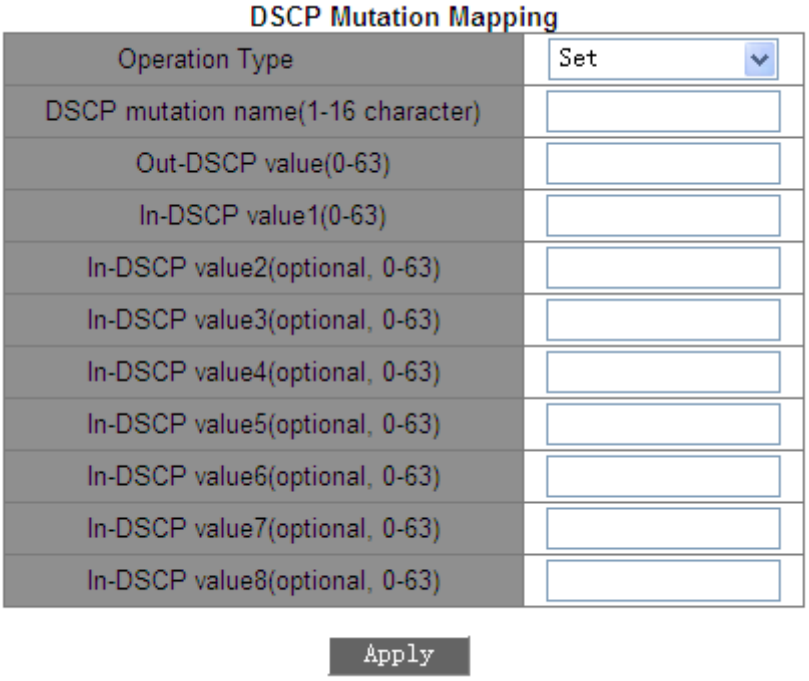


Figure 11-19 DSCP mutation mapping

11.5.6.4 IP priority-to-DSCP mapping

Click IP-Precedence-to-DSCP mapping to enter configuration page

Explanation:

Operation type-- set or delete

IP-Precedence value—IP priority (0-7)

DSCP value—corresponding DSCP value of IP priority

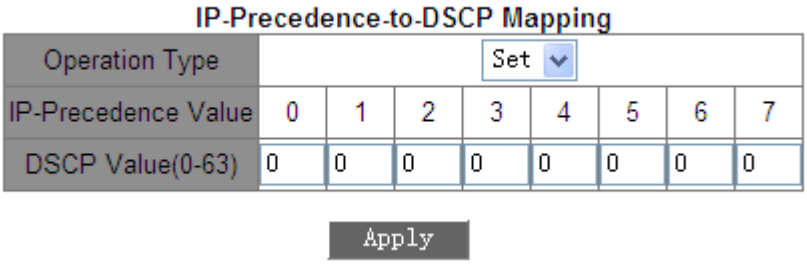


Figure 11-20 IP-Precedence-to-DSCP mapping

11.5.6.5 DSCP mark down mapping

Click DSCP mark down mapping to enter configuration page

Explanation:

Operation type-- set or delete

Mark down DSCP value—DSCP value after mark down

Policed DSCP value1-8—DSCP value list

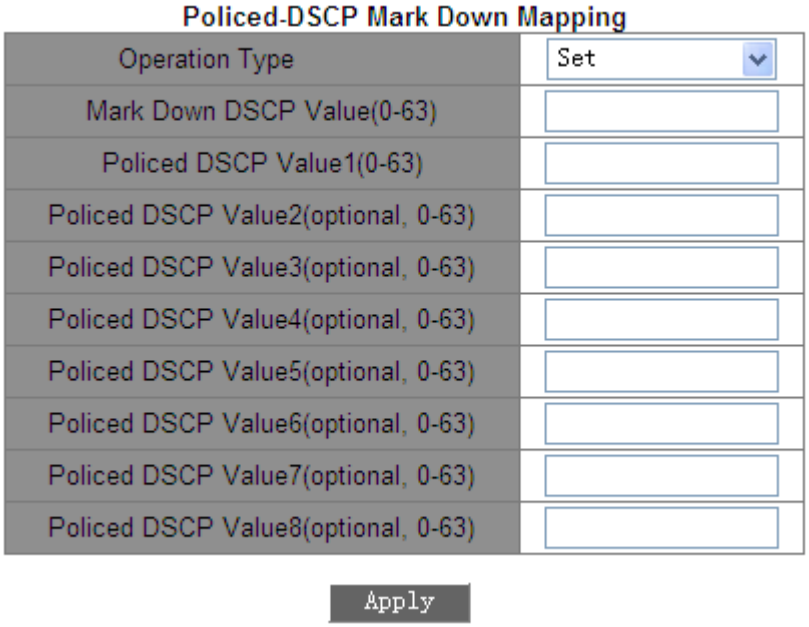


Figure 11-21 DSCP mark down mapping

Chapter 12 L3 forwrding configuration

12.1 layer 3 interface

12.1.1 layer 3 interface introduction

Layer 3 interface can be created in SICOM6496. Layer 3 interface is not a actual physical interface, it is a virtual interface. Layer 3 interface is based on VLAN. Layer 3 interface may contain one or multiple layer 2 interfaces (they all belong to a same VLAN), and doesn't contain layer 2 interface. At least one of layer 2 interfaces in layer 3 interface is in UP state, then layer 3 interface will be in UP state, otherwise, it is DOWN. Layer 3 interface is the basis of layer 3 protocols. We can configure IP address in layer 3 interface to operate IP transmission with other devices. Switch can forward IP protocol packets between different layer 3 interfaces.

12.1.2 Layer3 interface configuration

12.1.2.1 Task Sequence of Layer 3 Interface Configuration

1. create layer 3 interface

Command	explanation
Clobal configuration mode	
interface vlan *<vlan-id>* **no interface vlan *<vlan-id>***	create a VLAN interface (VLAN interface is a layer 3 interface) no command is to delete a VLAN interface

12.1.2.2 layer 3 interface configuration commands

12.1.2.2.1 interface vlan

Command: **interface vlan *<vlan-id>***

no interface vlan *<vlan-id>*

Function: careating a VLAN interface is to create a switch layer 3 interface; no command is to delete specified layer 3 interface

Parameter: ***<vlan-id>*** means VLAN ID of a created VLAN

Default: no layer 3 interface

User guide: before creating a VLAN interface (layer 3 interface), it need to configure VLAN. Use this command to create a VLAN interface (layer 3 interface) and enter VLAN interface configuration mode. After creating a VLAN interface (layer 3 interface), we can use interface vlan command to enter layer 3 interface mode.

Example: create a VLAN interface (layer 3 interface) in VLAN1

Switch (Config)#interface vlan 1

12.2 IP forwarding

12.2.1 IP forwarding introduction

Gateway devices can forward IP protocol packets from one subnet to another subnet and this forwarding is addressing through routes. SICOM6496 IP forwarding is assisted by hardware and reach wire speed forwarding. Meanwhile, it provides flexible control to adjust and monitor forwarding.

12.2.2 IP routing aggregation configuration

12.2.2.1 IP routing aggregation configuration

1. configure if use optimizing IP routing aggregation algorithm

Command	explanation
ip fib optimize	Configure switch to use optimizing IP

no ip fib optimize	routing aggregation algorithm; no command means not using optimizing IP routing aggregation algorithm

12.2.2.2 IP routing aggregation configuration command

12.2.2.2.1 ip fib optimize

Command: **ip fib optimize**

no ip fib optimize

Function: configure switch to use optimizing IP routing aggregation algorithm; no command menas no using optimizing IP routing aggregation algorithm

Default: do not use optimizing IP routing aggregation algorithm

User guide: this command is to achieve optimizing aggregation algorithm. The optimizing method is that: if routing table do not has default routing, create a virtual default routing according to the most quoted next hop to simplify aggregation results. The advantage of this method is effectively optimizing aggregation results, but disadvantage is that although decrease switch cpu load (by adding virtual default routing into chip segment routing table), but it might lead unnecessary data flow to next hop switch (actually it is forward some cpu load to the next hop switch)

Example: configure switch to unuse optimizing Ip routing aggregation algorithm

Switch (Config)# no ip fib optimize

12.2.3 IP forwarding troubleshooting help

12.2.3.1 monitoring and debugging command

12.2.3.1.1 show ip traffic

Command: **show ip traffic**

Function: show IP data packet statistical information

Command mode: privilege user configuration mode

User guide: show IP and ICMP data packet receicing and transmitting, etc statistical information

Example:

```
Switch #show ip traffic
IP statistics：
  Rcvd：  290 total, 44 local destination
          0 header errors, 0 address errors
          0 unknown protocol, 0 discards
  Frags： 0 reassembled, 0 timeouts
          0 fragment rcvd, 0 fragment dropped
          0 fragmented, 0 couldn't fragment, 0 fragment sent
  Sent：  0 generated, 0 forwarded
          0 dropped, 0 no route
ICMP statistics：
  Rcvd：  0 total 0 errors 0 time exceeded
          0 redirects, 0 unreachable, 0 echo, 0 echo replies
          0 mask requests, 0 mask replies, 0 quench
          0 parameter, 0 timestamp, 0 timestamp replies
  Sent：  0 total 0 errors 0 time exceeded
          0 redirects, 0 unreachable, 0 echo, 0 echo replies
          0 mask requests, 0 mask replies, 0 quench
```

0 parameter, 0 timestamp, 0 timestamp replies

Showing contents	explanation
IP statistics：	IP data packet statistical information
Rcvd： 290 total, 44 local destination 0 header errors, 0 address errors 0 unknown protocol, 0 discards	The total quantity of receiving packets and how many reach local device, how many data packets' packet headers have errors, how many wrong addresses, how many data packets of unclear protocols, how many packets are lost, etc
Frags： 0 reassembled, 0 timeouts 0 fragment rcvd, 0 fragment dropped 0 fragmented, 0 couldn't fragment, 0 fragment sent	frament statistics: how many packets are reassembled, timed out, the number of received fragments, dropped fragments, unable to be fragmented, transmitted fragments, etc
Sent： 0 generated, 0 forwarded 0 dropped, 0 no route	The totoal quantity of transmitted packets and how many packets are generated in local device, forwarded, dropped no routing,, etc
ICMP statistics：	ICMP data packets statisticstical information
Rcvd： 0 total 0 errors 0 time exceeded 0 redirects, 0 unreachable, 0 echo, 0 echo replies 0 mask requests, 0 mask replies, 0 quench 0 parameter, 0 timestamp, 0 timestamp replies	The total quantity of received ICMP data packets, and classify these ICMP data packets, and their statistical data after classification
Sent： 0 total 0 errors 0 time exceeded 0 redirects, 0 unreachable, 0 echo, 0 echo replies 0 mask requests, 0 mask replies, 0 quench 0 parameter, 0 timestamp, 0 timestamp replies	The total quantity of transmitted ICMP data packets, and classify these ICMP data packets, and their statistical data after classification

12.2.3.1.2 debug ip packet

Command:

Function: turn on IP message debugging switch; no command is to turn off debugging switch

Default: disable IP data packets debugging function

Command mode: privilege user configuration mode

User guide: show the conents of received and transmitted IP data packets, including sorce address, destination address, bytes, etc

Example: turn on IP message debugging switch

Switch #debug ip packet

IP PACKET： rcvd, src 1.1.1.1, dst 1.1.1.2, size 100

12.3 ARP

12.3.1 ARP introduction

ARP is short for Address Resolution Protocol, which is mainly used in IP address to Ethernet MAC address resolution. SICOM6496 not only support dynamic ARP, but also static configuration. Moreover, in certain application, SICOM6496 can configure ARP agent. When switch interface receives a ARP request, and the request IP address and interface address are in a same IP segment, but not in a same physical network, at that time if the interface enable ARP function, interface will send its MAC address as its response and forward received data packets.

12.3.2 ARP configuration

12.3.2.1 Task sequence of ARP configuration

1. configure static ARP
2. configure Agent ARP
3. clear dynamic ARP

1. configure static ARP

Command	explanation
arp *<ip_address>* *<mac_address>* {[ethernet] *<portName>*} **no arp *<ip_address>***	Cofigure static ARP table items; no command is to delete ARP table items

2. configure agent ARP

Command	explanation
ip proxy-arp **no ip proxy-arp**	Enable Ethernet agent ARP function; no command is to disable agent ARP function

3. clear dynamic ARP

command	explanation
Clear arp	Clear all dynamic arp

12.3.2.2 The command of ARP forwarding configuration

12.3.2.2.1 ARP

Command: **arp *<ip_address>* *<mac_address>* {[ethernet] *<portName>*}**

no arp *<ip_address>*

Function: configure static ARP items; no command is to delete static ARP items

Parameter: ***<ip_address>*** is IP address; ***<mac_address>*** is MAC address; **Ethernet** is Ethernet ports; ***<portName>*** is layer 2 port name

Default: no static ARP items

Command mode: VLAN interface configuration mode

Uising guide: configure static ARP items in switch

Example: configure static ARP in vlan1

Switch(Config-If-Vlan1)#arp 1.1.1.1 00-03-0f-f0-12-34 eth 1/2

12.3.2.2.2 ip proxy-arp

Command: **ip proxy-arp**

no ip proxy-arp

Function: enable agent ARP function in VLAN port; no command is to disable ARP function

Default: ARP function is disabled

Command mode: VLAN interface configuration mode

User guide: when layer 3 intreface received a ARP request, and the IP address of sending request and

the Layer 3 interface address are in a same IP segment, but not in a same physical network, and the layer 3 interface agent ARP function is enabled, layer 3 interface will reaply its MAC address to ARP request, then forward received data messages. Enable this function is to make the devices that are separated physically, but they are in a same IP segment ignore the fact forward by ARP interace like in a same physical network. Before agent ARP replying ARP request, it needs to check in the routing table and ensure that the destination network is available. Only the ARP request that can reach destination network will receive reply.

Note:

Example: enable agent ARP function in VLAN1

Switch(Config-If-Vlan1)#ip proxy-arp

12.3.2.2.3 clear arp

Command: clear arp

Function: clear all dynamic arp items

Default: **clear arp**

Command mode: privilege user configuration mode

User guide: clear all dynamic ARP items in switch modules

Example: clear all dynamic arp

Switch #clear arp

12.3.3 ARP forwarding troubleshooting

12.3.3.1 minitoring and debugging commands

12.3.3.1.1 show arp

Command: **show arp [<*ip-addr*>][<*vlan-id*>][<*hw-addr*>][type {static|dynamic}][count] }**

Function: show ARP mapping table

Parameter: **<*ip-addr*>** is to show speicified IP address items, **<*vlan-id*>** is to specified vlan identifier items; **<*hw-addr*>** is to show specified MAC address items; **static** is to shoe static ARP items, **dynamic** is to show dynamic ARP items, **count** is to show the number of ARP items

Command mode: privilege user configuration mode

User guide: show current ARP mapping table contents, such as IP address, hardware assress, hardware type, interface name, etc

Example:

Switch#sh arp

Total arp items: 3, the matched: 3, InCompleted: 0

Address	Hardware Addr	Interface	Port	Flag
50.1.1.6	00-0a-eb-51-51-38	Vlan50	Ethernet3/11	Dynamic
50.1.1.9	00-00-00-00-00-09	Vlan50	Ethernet1/1	Static
150.1.1.2	00-00-58-fc-48-9f	Vlan150	Ethernet3/4	Dynamic

Showing contents	explanation
Total arp items	The total quantity of ARP items
the matched	The number of ARP items which comply with filter rules
InCompleted	The number of ARP items which send ARP requests, but not received Arp reply
Addrss	IP address of ARP items
Hardware Address	haredware address of ARP items

Interface	the corresponding layer 3 interface of ARP items
Port	the corresponding layer 3 (physical) interface of ARP items
Flag	ARP items are static or dynamic

12.3.3.1.2 debug arp

Command: **debug arp**

no debug arp

Function: turn on ARP debugging switch; no command is to turn off debugging function

Default: disable ARP debugging function

Command mode: privilege user configuration mode

User guide: show received and transmitted ARP data packets contents, including type, source address, destination address

Example: enable ARP debugging switch

Switch #debug arp

ARP： rcvd, type 1, src 1.1.1.1 1234.1234.1234, dst 1.1.1.2 5678.5678.5678

12.3.3.2 ARP troubleshooting help

Switch is unable to ping directly connected network device, please check as follows and their solutions:

- please check if switch learn corresponding ARP
- if ARP cann't be learned, use ARP debugging information
- the often problems occur in cable

12.4 WEB management

12.4.1 Layer 3 interface configuration

Click Device Advanced Configuration→L3 Interface Configuration→Add interface VLAN to create or delete layer 3 interface, which is equivalent to CLI command 12.1.2.2.1

Interface VLAN ID (1-4093)--spcified VLAN ID

Add--create a layer 3 interface of a specified VLAN ID

Delete—delete a layer 3 interface of a specified VLAN ID

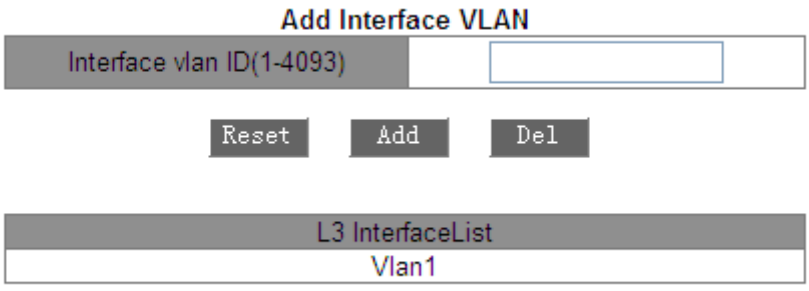


Figure 12-2 create a VLAN interface

12.4.2 IP route aggregation configuration

Click Device Advanced Configuration→IP Route Aggregation Configuration→Route Aggregation Configuration to ensure if optimize IP routing aggregation algorithm, which is equivalent to CLI command 12.2.2.2.1

Apply- use optimizing IP routing aggregation algorithm

Default—unuse optimizing IP routing aggregation algorithm

Figure 12-2 IP routing aggregation configuration

12.4.3 ARP configuration

In ARP configuration mode, user can configure static arp, arp proxy, clear dynamic arp, check arp itmes

Click Device Advanced Configuration→ARP configuration→ARP configuration to configure static ARP, which is equivalent to CLI command 12.3.2.2.1

IP address-- IP address of a specified static arp item

MAC address--MAC address of a specified arp item

Operation type--add static arp item or delete static arp item (selct in a pull down menu)

VLAN interface-layer 3 interface for specifed static arp (select ina pull down menu)

Port-- layer 2 interface for specified layer 2 interface (select in pull down menu)

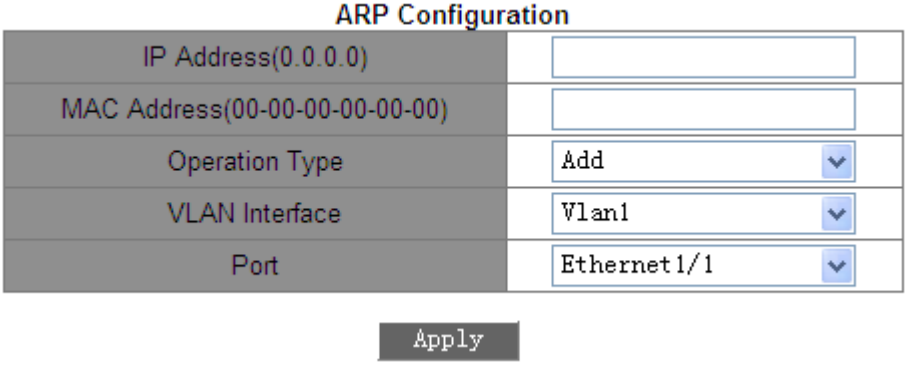


Figure 12-3 ARP configuration

Click Device Advanced Configuration→ARP configuration→Clear ARP Cache to delete all dynamic arp items, which is equivalent to CLI command 12.3.2.2.3

Apply--delete all dynamic arp

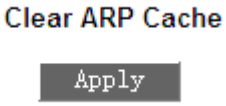


Figure 12-4 clear ARP cache

Click Device Advanced Configuration→ARP configuration→Show ARP to show all ARP items , which is equivalent to CLI command 12.3.3.1.1

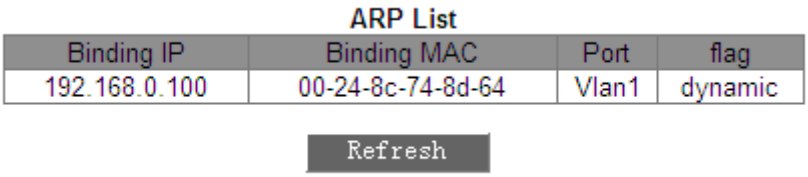


Figure 12-5 ARP list

Click Device Advanced Configuration→ARP configuration→Proxy ARP Configuration to set ARP proxy, which is equivalent to CLI command 12.3.2.2.2

VLAN interface-- layer 3 interface specified to set arp proxy (select in a pull down menu)

Apply-setting arp proxy

Default- -delete arp proxy

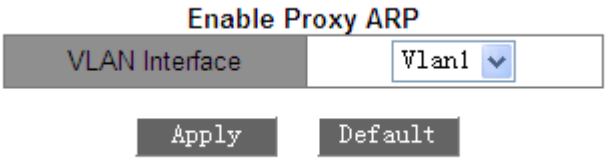


Figure 12-6 configure ARP proxy

Chapter 13 routing protocol configuration

13.1 routing table

SICOM6496 layer 3 switch supported various routing protocols and defult priorities of finding out routing are shown in follwing figure:

Routing protocol or routing type	Priority default value
direct connnected route	0
OSPF	110
Static routing	1
RIP	120
OSPF ASE	150
IBGP	200
EBGP	20
Unknown routing	255

13.2 static routing

13.2.1 static routing configuration

13.2.1.1 task sequence of static ruting

1.static routing configuration

2. default routing configuration

1. static routing configuration

Comamand	explanation
Global Configuration mode	
ip route *<ip_address>* *<mask>* *<gateway>* [*<preference>*] **no ip route *<ip_address>* *<mask>* *<gateway>* [*<preference>*]**	Configrue static routing; no command is to delete static routing

2. default routing configuration

Command	explanation
Global configuration mode	
ip route 0.0.0.0 0.0.0.0 *<gateway>* [*<preference>*] **no ip route 0.0.0.0 0.0.0.0 *<gateway>* [*<preference>*]**	Configure default routing; no command is to delete default routing

13.2.1.2 static routing configuration commands

13.2.1.2.1 ip route

Command: **ip route *<ip_address>* *<mask>* *<gateway>* [*<preference>*]**

no ip route *<ip_address>* *<mask>* *<gateway>* [*<preference>*]

Function: configure static routing; no command is to delete static routing

Parameter: ***<ip_address>*** and ***<mask>*** are destination IP address and subnet mask with dot-decimal format; ***<gateway>*** s the netxt hop IP address with dot-decimal format; ***<preference>*** is routing priority in a range of 1~255, the less of the vale of preference, the higher of the priority

Default: the default priority of SCOM6496 layer 3 switch static routing is 1

Command mode: global configuration mode

User guide: when configure the netxt hop of static routing, we can adopt the method of specifying routing data packets to send the next hop IP address

The default preference vaules of SICOM6496 layer 3 switch various routing types:

Routing type	Preference value
Diect linked routing	0
Static routing	1
OSPF	110
RIP	120
IBEP	200
EBGP	20

Under the circumstance of not changing various routing preference value, the direct connected route has highest priority, the second is static routing, then is EBGP, OSPF, RIP, IBGP in turn

Example 1: add a static routing

Switch(config)#ip route 1.1.1.0 255.255.255.0 2.1.1.1

Example 2: delete default routing

Switch(config)#ip route 0.0.0.0 0.0.0.0 2.2.2.1

13.2.1.2.2 show ip route

Command: **show ip route [dest <*destination*>] [mask <*destMask*>] [nextHop <*nextHopValue*>] [protocol {connected | static | rip| ospf | ospf_ase | bgp | dvmrp}] [<*vlan-id*>] [preference <*pref*>] [count]**

Function: show routing table

Parameter: **<*destination*>** is destination network address; **<*destMask*>** is destination network mask; **<*nextHopValue*>** is the next hop IP address; **connected** is direct connected route, **static** is static route, **rip** is RIP route; **ospf** is OSPF rute; **ospf_ase** is route brought by OSPF; **bgp** is BGP route; **dvmrp** is DVMRP route; **<*vlan-id*>** is VLAN indentifier; **<*pref*>** is routing priority in a range og 0~255; **count** is the number of IP routing table items

Command mode: privilege user configuration mode

User guide: show the contents of core routing table, inclucing routing type, destination network, mask, next hop address, interface, etc

Example:

Switch#show ip route

Total route items is 4, the matched route items is 4

Codes: C - connected, S - static, R - RIP derived, O - OSPF derived

A - OSPF ASE, B - BGP derived, D - DVMRP derived

	Destination	Mask	Nexthop	Interface	Preference
C	1.1.1.0	255.255.255.0	0.0.0.0	Vlan1	0
C	4.4.4.0	255.255.255.0	0.0.0.0	Vlan4	0
S	6.6.6.0	255.255.255.0	9.9.9.9	Vlan9	1
R	7.7.7.0	255.255.255.0	8.8.8.8	Vlan8	120

Showing contents	explanation
C - connected	direct connected route: the segment which is directly

	connected with layer 3 siwtch
S – static	static routing which is manually configured by user
R - RIP derived	RIP ruote obtained by layer 2 switch through RIP protocol
O - OSPF derived	OSPF routing obtained by layer 3 switch through OSPF protocol
A- OSPF ASE	route led in by OSPF
B- BGP derived	route obtained through BGP protocol
Destination	destination netowork
Mask	destination network mask
Nexthop	the next hop IP address
Interface	the next hop layer 3 switch interface
Preference	Routing priority: if there are another type of routes in the destination network, only the highest priority information is indicated in core routing table

13.2.2 configuration example

In below figure, 3 units of SICOM6496 form a simple network. The network masks of switches and PCs are 255.255.255.0. Configure static routes between SWITCH1 and SWITCH3 to make PC1 and PC3 communicate; in SWITCH3, configure static route to SWITCH2 to achieve the communication between PC3 and PC2; configure default routes in SWITCH2 to make coomunication between PC2 to PC3.

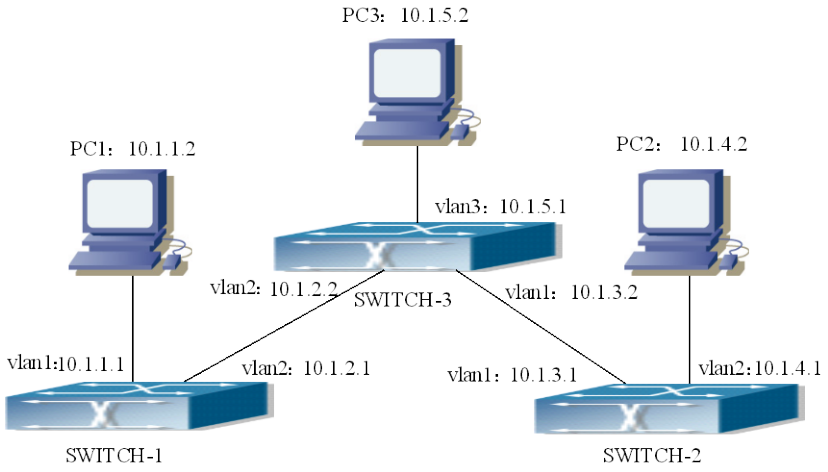


Figure 13-1 static routes

Configuration steps:

SWITCH1 configuration:

Switch#config

Switch(config)#ip route 10.1.5.0 255.255.255.0 10.1.2.2

SWITCH3 configuration:

Switch#config

the next hop adopts the other end IP address.

Switch(config)#ip route 10.1.1.0 255.255.255.0 10.1.2.1

the next hop adopts the other end IP address.

Switch(config)#ip route 10.1.4.0 255.255.255.0 10.1.3.1

SWITCH2 Configuration:

Switch#config

Switch(config)#ip route 0.0.0.0 0.0.0.0 10.1.3.2

In this way, PC1 and PC3, PC2 and PC3 can communicate by Ping command

13.2.3 troubleshooting help

13.2.3.1 monitoring and debugging command

Command	explanation
Authorized mode	
show ip route	Show the contents of routing table, inclucing routing type, destination network, mask, nexthop address, interface,etc

Use show ip route command to show static routing's IP address, network mask, and nexthop IP address, forwarding interface, etc in routing table

For Switch#show ip route

Total route items is 1, the matched route items is 1

Codes: C - connected, S - static, R - RIP derived, O - OSPF derived

A - OSPF ASE, B - BGP derived, D - DVMRP derived

	Destination	Mask	Nexthop	Interface	Preference
C	2.2.2.0	255.255.255.0	0.0.0.0	vlan1	0
S	6.6.6.0	255.255.255.0	2.2.2.9	vlan1	1

S means static routing. Its destination network address is 6.6.6.0, network mask is 255.255.255.0 and nexthop address is 2.2.2.9 and the preferenace is 1

13.3 RIP

13.3.1 RIP introduction

The Routing Information Protocol (RIP) is a dynamic routing protocol used in local and wide area networks. RIP is a distance-vector routing protocol, which employs the hop count as a routing metric

13.3.2 RIP Configuration

13.3.2.1 task sequence of RIP configuration

1. enable RIP protocol (mandatory)

1) enable RIP module/disable RIP module

2) configure interface to enable transmitting/receiving RIP datagram

2. configure RIP protocol parameter (optoional)

1) configure RIP sending packets mechanism

a) configure RIP datagram are tranmitedd at a fixed time

b) configure RIP broadcast

2) configure RIP routing parameters

a) configure routing aggregation

b) configure importedroutes (default routing weight value, configure routes which bring other ptotocols in RIP

c) configure added routing weight value of interface transmitting and receiving RIP datagram

d) configure interface verification mode and password

3) configure RIP protocol other parameters

a) configure RIP routing priorities
b) configure zero dimain checking of RIP datapackets
c) configure timer time of RIP renewal, timeout, control
3. configure RIP-I/RIP-II mode switching
1) configure RIP version used by all interface
2) configure interface transmitting/receiving RIP version
3) configure if interface transmitting/receiving RIP datagram
4. disable RIP protocol

1. enable RIP protocol

the basic configuration of operating RIP routing protocol in SICOM6496 layer 3 switch is simple. Generally, we need to turn on RIP switch, enable transmitting and receiveing RIP datagram, that means transmitting and receivieng RIP datagram according to RIP default condiguration (by default, SIOCM6496 layer 3 switch transmitting RIP-II and receiving RIP-I and RIP-II). If it is needed, we can switch transmitting, receiving RIP datagram version, allow or deny transmitting, receiving RIP datagram, please refer to 3

Command	explanation
Global configuration mode	
[no] router rip	Enable RIP protocol; no command is to disable RIP protocol
Interface configuration mode	
[no] ip rip work	Set to transmit and receive RIP datagram in interface; no command is to shutdown RIP datagram transmitting and receiving in interface

2. configure RIP protocol parameters
1) configure RIP transmitting packets mechanism
a) configure to transmit RIP datagram in a fixed time
b) configure RIP broadcast

Command	explnantion
RIP protocol configuration mode	
[no] rip broadcast	allow all ports in RIP layer 3 swich transmitting broadcast packets or multicast packets; no command is to forbid all ports transmitting droadcast packets or multicast packets

2) configure RIP routing parameter
a) configure routing aggregation

Command	解释
RIP protocol configuration mode	
auto-summary **no auto-summary**	Configure routing aggregation function; no command is to disable routing aggregation function

b) configure importedroute (default routing weight value, configure routes which bring other protocols in RIP)

Command	explanation
RIP protocol configruaiton mode	
default-metric <*value*> **no default-metric**	Set the default routing weight value of brought route; no command is to restore default configuration
redistribute { static | ospf | bgp} **[metric <*value*>]** **no redistribute { static | ospf | bgp }**	routes which lead in static, OSPF protocol or BGP protocol; no command is to delete the routes which lead in corresponding protocols

c) configure added routing weight value of interface transmitting/receiving RIP datagram

Command	explanation
Interface configuration mode	
ip rip metricout <*value*> **no ip rip metricout**	Set the added routing weight value when interface transmitting RIP datagram; no command is to restore default transmiting added routing weitght value
ip rip metricin <*value*> **no ip rip metricin**	Set the added routing weight value when interface receiving RIP datagram; no command is to restore default receiving added routing weitght value

d) configure interface authentication mode and password

Command	explanantion
Interface configuration mode	
ip rip authentication mode {text| md5 type {cisco|usual}} **no ip rip authentication mode**	Set the thype of authentication mode; no command is to set default value, means using text authentication
ip rip authentication key-chain <*name-of-chain*> **no ip rip authentication key-chain**	Set the key of authentication; no command is to unuse authentication key

3) configure RIP protocol other parameters

a) configure RIP routing priority

b) configure zero field checking of RIP datagram

c) condigrue the timer time of RIP renewal, timeout, control

Command	explanation
RIP protocol configuration mode	
rip preference <*value*> **no rip preference**	Specify RIP protocol routing priority; no command is to restore default value
[no] rip checkzero	Enable zero field checking of RIP-I datagram. If the value of zero field is not zero, the packets are refused; no command is to stop checkzero for zero field
timer basic <*update*> <*invalid*> <*holddown*> **no timer basic**	Adjust the time of RIP timer renewal, expiration, control

3. configure RIP-I/RIP-II mode switching

1) configure RIP version used by all ports

Command	explanation
RIP protocol configuration mode	
version { 1 | 2 } **no version**	Set the version of RIP datagram transmitted or received by all layer 3 switch interfaces; no command is to restore default configuration, means that transmitting version 2 datagram and receiving version 1 and version 2 datagram

2) configure RIP version of transmitted or receivied by interface

3) configure interface if transmitting or receving RIP datagram

Command	explanation
Interface configuration mode	
ip rip send version { v1 | v2 [bc|mc] } **no ip rip send version**	Set the version of RIP datagram transmitted by interface; no command is to restore to default configuration, means transmitting version 2
ip rip receive version {v1 | v2 | v12} **no ip rip receive version**	Set the version of RIP datagram received by interface; no command is to restore to default configuration, means received version 1 and version 2 RIP datagram
[no] ip rip input	Set receiving RIP datagram in interface; no command is to stop receiving RIP datagram in interface
[no] ip rip output	Set transmitting RIP datagram in interface; no command is to stop transmitting RIP datagram in interface

4. disable RIP protocol

Command	explanation
global configuration mode	
no router rip	Disable RIP routing protocol

13.3.2.2 RIP configuration command

- **auto-summary**
- **default-metric**
- **ip rip authentication key-chain**
- **ip rip authentication mode**
- **ip rip metricin**
- **ip rip metricout**
- **ip rip input**
- **ip rip output**
- **ip rip receive version**
- **ip rip send version**
- **ip rip work**

- **ip split horizon**
- **redistribute**
- **rip broadcast**
- **rip checkzero**
- **rip preference**
- **router rip**
- **timer basic**
- **version**
- **show ip protocols**
- **show ip rip**
- **debug ip rip packet**
- **debug ip rip recv**
- **debug ip rip send**

13.3.2.2.1 auto-summary

Command: **auto-summary**

no auto-summar

Function: configure routing aggregation function; no command is to delete routing aggregation function

Parameter: none

Default: disable auto-aggregation function

Command mode: RIP protocol configuration mode

User guide: routing aggregation reduces the amount of routing information in routing table and the amount of switching information. RI-1 do not support subnet mask, so if forwarding subnet route might cause ambiguity, so RIP-1 always enable routing aggregation function. If use RIP-2, use no auto-summary command to disable routing aggregation function. When user want to broadcast subnet routes, disable routing aggregation function.

Example: set RIP version to RIP-2 and disable routing aggregation function

Switch(Config)#router rip

Switch(Config-Router-Rip)#version 2

Switch(config-router-rip)#no auto-summary

Realted Command: version

13.3.2.2.2 default-metric

Command: **default-metric <*value*>**

no default-metric

Function: set the default routing weight value for lead in route; no command is to restore default value

Parameter: **<*value*>** is routing value in a range of 1~16

Default: routing vaule is 1

Command mode: RIP prorotcol configuration mode

User guide: **default-metric** command is used to set default routing value whenn lead routes of other routing protocol in RIP routing.when use **redistribute** command to lead other protocol routes, if not specify specific routing value, use default routing value specified by **default-metric** to lead in.

Example: set the default routing value of leading in other routing parotocols in RIP routing to 3

Switch(config-router-rip)#default-metric 3
Related Command: **redistribute**

13.3.2.2.3 ip rip authentication key-chain

Command: **ip rip authentication key-chain *<name-of-chain>***
no ip rip authentication key-chain
Function: set the key of RIP authentication; no command is to cancel RIP authentication
Parameter: ***<name-of-chain>*** is a string with max 16 characters
Default: interface configuration mode
User guide: no command is to cancel RIP authentication, no delete the key used in RIP authentication
Related Command: **ip rip authentication**

13.3.2.2.4 ip rip authentication mode

Command: **ip rip authentiaction mode {text|md5 type {cisco|usual}}**

no ip rip authentication mode
Function: set the type of authentication; no command is to restoer default authentication tupe, text authentication
Parameter: **text** means text authentication; **mds** means MD5 authentication and MD5 authentication can be dividied to Cisco MD5 and general MD5
Default: text authentication
Command mode: interface configuration mode
User guide: RIP-I do not support authentication, RIP-II supports two types of authentication: Text authentication (Simple authentication) and datagram authentication (MD5 authentication). There are two types of datagram formats of MD5 authentication: one complies with RFC1723 (RIP Version 2 Carrying Additional Information) rules and the other complies with RFC2082 (RIP-II MD5 Authentication) rules
Example: set Cisco MD5 authentication of RIP message in vlan1. The authentication key is KYLAND
Switch(config-If-Vlan1)#ip rip authentication mode md5 type cisco
Switch(config-If-Vlan1)#ip rip authentication key-chain KYLAND
Related Command: **ip rip authentication key-chain**

13.3.2.2.5 ip rip metricin

Command: **ip rip metricin <*value*>**
no ip rip metricin
Function: set added routing value of interface receiving RIP messages; no command is to restore default value
Parameter: **<*value*>** is added routing value in a range of 1~15
Default: added routing value is 1 when RIP receiving message
Command mode: interface configuration mode
Related Command: **ip rip metricout**

13.3.2.2.6 ip rip metricout

Command: **ip rip metricout <*value*>**
no ip rip metricout
Function: set added routing value of interface transmitting RIP messages; no command is to restore default value

Parameter: ***<value>*** is added routing value in a range of 0~15
Default: added routing value is 0 when RIP transmitting message
Command mode: interface configuration mode
Example: set added routing value to 5 when vlan1 receving RIP message, and 3 when transmitting RIP message
Switch(config-If-Vlan1)#ip rip metricin 5
Switch(config-If-Vlan1)#ip rip metricout 3
Related Command: **ip rip metricin**

13.3.2.2.7 ip rip input

Command: **ip rip input**
no ip rip input
Function: set interface to be bale to receive RIP message; no command is that interface can't receive RIP message
Default: interface receive RIP message
Command mode: interface configuration mode
User guide: this command shouls be used with other two commands: **ip rip output** and **ip rip work**; **ip rip work** is equivalent to **ip rip input** & **ip rip output** in function; input and output commands are used to respectively control interface receiving and transmitting RIP meassage' work command is a sum of functions of in nad out commands
Related Command: ip rip output

13.3.2.2.8 ip rip output

Command: **ip rip output**
no ip rip output
Function: set interface to be bale to transmit RIP message; no command is that interface can't trsnsmit RIP message
Default: interface transmit RIP message
Command mode: interface configuration mode
User guide: this command shouls be used with other two commands: **ip rip input** and **ip rip work**; **ip rip work** is equivalent to **ip rip input** & **ip rip output** in function; input and output commands are used to respectively control interface receiving and transmitting RIP meassage' work command is a sum of functions of in nad out commands
Related Command: ip rip input

13.3.2.2.9 ip rip receive version

Command: **ip rip receive version {v1 | v2 | v12}**
no ip rip receive version
Function: set interface received RIP message version. By default, receiving RIP version 1 and 2; no command is to restore default value
Parameter: **v1** and **v2** means RIP version 1 and version 2, v12 means RIP version1 or version2
Default: v12 at default, means RIP v1 and v2 are all received
Command mode: interface configuration mode

13.3.2.2.10 ip rip send version

Command: **ip rip send version { v1 | v2 [bc|mc] }**

no ip rip send version

Function: set interface transmitted RIP message version; no command is to restore default value

Parameter: **v1 | v2** are RIP version number; **[bc|mc]** is set only when transmitting RIP version 2, which is used to specify transmitting mode, BC is broadcast mode, MC is multicast mode. When configure to transmit RIP v2 message, interface at default transmit RIP v2 message in multicast mode; only after setting BC, brocast message can be transmitted in this interface.

v1 and v2 means RIP version 1 and version 2, v12 means RIP version1 or version2

Default: v12 at default, means RIP v1 and v2 are all received

Command mode: interface configuration mode

Default: transmit RIP v2 at default

Command mode: interface configuration mode

User guide: when configure interdace to transmit RIP v2 message, default transmitting mode is multicast mode. After setting BC mode, broadcast message can be transmitted in the interface

13.3.2.2.11 ip rip work

Command: **ip rip work**

no ip rip work

Function: set if operate RIP protocol in interface; no command is that do not transmit and receive RIP message in the interface

Default: turn on the RIP routing switch, interface operate RIP protocol at default

Command mode: interface configuration mode

User guide: this command is equivalent to **ip rip input** & **ip rip output** in function. The input and output command are to respectively control receiving and transmitting RIP message in interface; wotk command is a sum of functions of input and utput commands.

Related Command: ip rip input、ip rip output

13.3.2.2.12 ip split-horizon

Command: **ip split-horizon**

no ip split-horizon

Function: set allowing horizontal split; no command is to forbid horizontal split

Default: allowing horizontal split

Command mode: interface configuration mode

User guide: horizontal split is to avoid routing loops, means avoid routes learned from an interface are broadcasted from this interface again

Example: forbid horizontal split in vlan1

Switch(config)#interface vlan1

Switch(config-If-Vlan1)#no ip split-horizon

13.3.2.2.13 redistribute

Command: **redistribute { static | ospf | bgp} [metric <*value*>]**

no redistribute { static | ospf | bgp }

Function: redistribute routes of other routing protocols in RIP routing; no command is to cancel redistribution

Parameter: **static** means redistributing static routing, ospf means redistributing OSPF routing; **bgp** is to redistribute BGP routing, ***<value>*** is that use how much the routing value to redistribute routes ina range of 1~16

Default: do not redistribute other routings at RIP default. If redistribute other routing protocols, but do not specify its metric value, it will be redistributed accrording to default metric value
Command mode: RIP configuarion mode
User guide: adopt this command to redistribute other routings to work as RIP routing to increase RIP performance
Example: the routing value is 5 when distributing OSPF protocol routing to RIP message, and routing value of static routing is 8
Switch(Config-Router-Rip)#redistribute ospf metric 5
Switch(Config-Router-Rip)#redistribute static metric 8

13.3.2.2.14 rip broadcast

Command: **rip broadcast**
no rip broadcast
Function: configure all ports in layer 3 switch to transmit RIP broadcast packets or multicast packets; no command is to fobid all ports transmitting broadcast packets or multicast packets, only transmitting RIP data packets between nerighbour layer 3 switches
Default: transmit RIP broadcast packets
Command mode: RIP configuration mode

13.3.2.2.15 rip checkzero

Command: **rip checkzero**
no rip checkzero
Function: use this command to check RIP message zero filed; no command is to stop checking zero in zewro domain. Because there is not zero field in RIPII message, this command doesn't work to RIPII
Default: operate zero checking of RIPI message
Command mode: RIP protocol configuration mode
User guide: there must be zero field in RIPI message. Use this command to perform or forbid zero checking of RIPI message. If receive not zero RIP message in zero filed, system will drop this RIPI message
Example: do not perform zero checking to RIPI message
Switch(config-router-rip)#no ip checkzero

13.3.2.2.16 rip preference

Command: **rip preference <*value*>**
no rip preference
Function: specify RIP protocol routing priority; no command is to restore default value
Parameter: **<*value*>** is to specify priority value in a range of 0~255
Default: RIP priority is 120 at default
Command mode: RIP protocol configuration mode
User guide: each routing protocol has its priority. Its default value is decided by routing policy. The priority will decide routes in core routing table will adopt which kind of routing algorithm to obtain best routing. Use can use this command to manually configure RIP priorities. After the configuration, it will take effect to new route. Which is depends on the property of RIP protocol, RIP priority should not be too high.
Example: set RIP priority to 10
Switch(config-router-rip)#rip prefenrence 10

13.3.2.2.17 router rip

Command: **router rip**

no router rip

Function: enable RIP routing progress and enter RIP configuration mode; no command is to disable RIP routing protocol

Default: do not operate RIP routing

Command mode: global configuration mode

User guide: use this command to turn on RIP routing protocol switch. This command must be open when make other configuration of RIP protocol

Example; enable RIP protocol configuration mode

Switch(Config)#router rip

Switch(Config-Router-Rip)#

13.3.2.2.18 timer basic

Command: **timer basic *<update> <invalid> <holddown>***

no timer basic

Function: adjust the time of RIP timer renewal, expiration, control; no command is to restore default configuration

Parameter: ***<update>*** is the time interval of sending uodated message with the unit of second and in a range of 1～2147483647; ***<invalid>*** is the time range of declaring RIP routing invalid in a range of 1～2147483647; ***<holddown>*** is the time range of routing exiting in routing table after invalid declaration with a unit of second and in a rangr of 1～2147483647

Default: the default value of ***<update>*** is 30; the deault value of ***<invalid>*** is 180 and the default vaule of ***<holddown>*** is 120

Command mode: RIP protocol configuration mode

User guide: at default, system will broadcast RIP updated message every 30 seconds. If it doesn't receive updated message of a routing after 180 seconds, this routing is look as invalid, but this routing can exist in routing table for 120 seconds, after 120 seconds, this route will be deleted from routing table. When adjusting the time of RIP timers, the time range of declaring RIP routing invalid must be longer than RIP updated time range, and holddown time range (it is that after invalid decleration of RIP routing, the time range of delecting this routing from routing table) also should be longer than RIP updated time range and must be exact multiple

Example: set the the time range of updated routing table to 20 seconds, the time range of invalid declaration to 80 seconds and the time range of delecting routing items to 60 seconds

Switch(Config-Router-Rip)#timer basic 20 80 60

13.3.2.2.19 version

Command: **version {1| 2}**

no version

Function: set the version of RIP datagram which are transmitted and received by all routing interfaces; no command is to restore default configuration

Parameter: **1** means rip version 1, **2** means rip version 2

Default: sending version 1, receiving version 1 and version 2 data gram

Command mode: RIP protocol configuration mode

User guide: it mens that all switch ports only transmit or receive RIP-I data gram, 2 means layer 3

switch ports only transmit or receive RIP-II datagram. At default, sending RIP-II and meanwhile receiving RIP-I and RIP-II datagram

Example: set the version of RIP datagram transmitted or received by interface to 2

Switch(config-router-rip)#version 2

Related commands: **ip rip receive version**

ip rip send version

13.3.2.2.20 show ip protocols

Command: **show ip protocols**

Function: show layer 3 switch current operating routing ptotocol information

Command mode: privilege user configuration mode

User guide: according to the output information of this command, user can ensure if configured routing ptotocol is right and perform routing trouble diagnosis

Example:

Switch#sh ip protocols

RIP information

rip is turning on

default metrict 16

neighbour is:NULL

preference is 100

rip version information is:

interface	send version	receive version
vlan2	V2BC	V12
vlan3	V2BC	V12
vlan4	V2BC	V12

Showing contents	explanation
RIP is turning on	currently operating routing protocol is RIP protocol
default metric	default metri value of RIP protocol
neighbour is:	address of the layer 3 switch which is the neighbor and connected with local RIP layer 2 switch
Preference	the priority of RIP routing
rip version information	Show the version information of currently operating RIP protocol, including sending RIP version (V1 means RIPI, V2 means RIPII), RIP sending mode (BC means broadcast, MC means multicast), receiving RIP version (V1 means RIPI, V2 means RIPII, V12 means receiving RIPI and RIPII at the same time)

13.3.2.2.21 show ip rip

Command: **show ip rip**

Function: show current RIP operation status and configuration information

Command mode: privilege user configuration mode

User guide: according to the output information of this command, user can check RIP routing default value, specified sending destination address, priority value,etc

Example:

Switch#sh ip rip
RIP information
rip is turning on
default metric 16
neighbour is
preference is 100

Showing contents	explanation
rip is turning on	RIP 路由进程已打开；enable RIP routing progress
default metric 16	default vaule of redistributed routing is 16
neighbour is	sending destination address at a fixed location
preference is 100	RIP routing priority is 100

13.3.2.2.22 debug ip rip packet

Command: **debug ip rip packet**
no debug ip rip packet
Function:turn on RIP message receiving and transmitting information debugging switch; no command is to turn off this debugging switch
Default: trun off debugging switch
Command mode: privilege user configuration mode
Example:
Switch#debug ip rip pa
"debug ip rip pa" executed successfully.
00：04：20：

start at 260**********
send packets to 11.11.11.2
packet header： cmd： response, version： 1
no. dest dest_mask gatedway metric
1： 159.226.0.0 0.0.0.0 0.0.0.0 1
00：04：20：

start at 260**********
send packets to 159.226.255.255
packet header： cmd： response, version： 1
no. dest dest_mask gatedway metric
1： 159.222.0.0 0.0.0.0 0.0.0.0 2
2： 11.11.11.2 0.0.0.0 0.0.0.0 2
00：04：20：

start at 260**********
received a rip packet from 159.226.42.1
rip packet cmd ： 2 version：1

13.3.2.2.23 debug ip rip recv

Command: **debug ip rip recv**

no debug ip rip recv

Function: turn on debugging switch of receiving information of RIP message; no command is to turn off debugging switch

Default: turn off debugging switch

Command mode: privilege user configuration mode

Example:

Switch#debug ip rip rec

start at 230**********

received a rip packet from 159.226.42.1

rip packet cmd ： 2 version：1

00：03：59：

start at 238**********

received a rip packet from 11.11.11.2

rip packet cmd ： 2 version：1

00：03：59：

rip receive response

packet head 14872964; packet end 14872984

recv packets from 11.11.11.2

packet header： cmd： response, version： 1

no.	dest	dest_mask	gatedway	metric
1：	159.222.0.0	0.0.0.0	0.0.0.0	1

13.3.2.2.24 debug ip rip send

Command: **debug ip rip send**

no debug ip rip send

Function: turn on debugging switch of transmitting information of RIP message; no command is to turn off debugging switch

Default: turn off debugging switch

Command mode: privilege user configuration mode

Example:

Switch#debug ip rip send

00：02：50：

start at 170**********

send packets to 11.11.11.2

packet header： cmd： response, version： 1

no.	dest	dest_mask	gatedway	metric
1：	159.226.0.0	0.0.0.0	0.0.0.0	1

00：02：50：

start at 170**********

send packets to 159.226.255.255

packet header： cmd： response, version： 1

no.	dest	dest_mask	gatedway	metric
1：	159.222.0.0	0.0.0.0	0.0.0.0	2
2：	11.11.11.2	0.0.0.0	0.0.0.0	2

13.3.3 RIP typical example

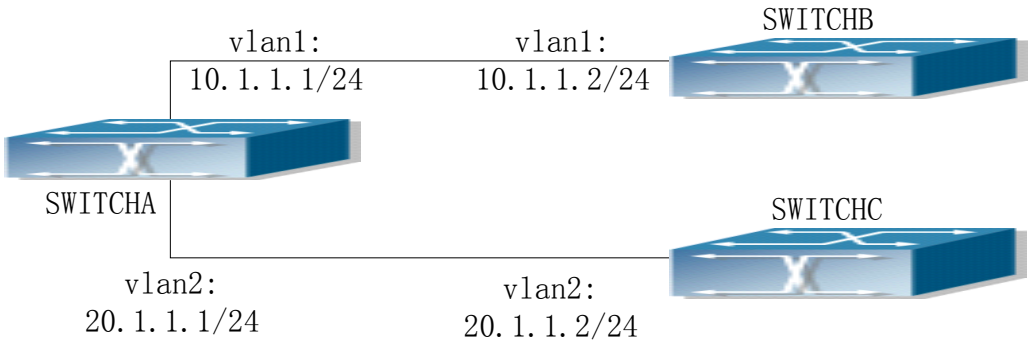


Figure 13-2 RIP example

As above figure, layer 3 switches form a network. Switch A is connected with vlan 1 of Switch B and vlan 2 of Switch C, and three layer 3 switches all operate RIP routing protocols. Set SWITCHA vlan1：10.1.1.1， vlan2：20.1.1.1only exchange updated information with SWITCHB vlan1：10.1.1.2, not to SWITCHC vlan2：20.1.1.2

The configuration of Switch A, Switch B and Switch C are as follows:

a) layer 3 switch SWITCHA

configure IP address of vlan1

SWITCHA#config

SWITCHA(config)# interface vlan 1

SWITCHA(Config-If-Vlan1)# ip address 10.1.1.1 255.255.255.0

SWITCHA (config-If-vlan1)#exit

Configure IP addres of vlan2

SWITCHA(config)# interface vlan 2

SWITCHA(config-If-vlan2)# ip address 20.1.1.1 255.255.255.0

Enable RIP protocol;

SWITCHA(config)#router rip

SWITCHA(config-router-rip)#exit

Enable vlan1 to transmit or receive RIP datagram

SWITCHA(config)#interface vlan 1

SWITCHA(config-If-vlan1)#ip rip work

SWITCHA(config-If-vlan1)#exit

Enable vlan2 to transmit or receive RIP datagram

SWITCHA (config-If-vlan2)# ip rip work

SWITCHA (config-If-vlan2)#exit

SWITCHA(config)#exit

SWITCHA#

b) layer 3 SWITCHB

configure IP address of vlan1

SWITCHB#config
SWITCHB(config)# interface vlan 1
SWITCHB(config-If-vlan1)# ip address 10.1.1.2 255.255.255.0
SWITCHB (config-If-vlan1)exit
Enable RIP protocol and configure IP address of neighbor layer 3 switch
SWITCHB(config)#router rip
SWITCHB(config-router-rip)#exit
Enable vlan1 to transmit or receive RIP datagram
SWITCHB(config)#interface vlan 1
SWITCHB (config-If-vlan1)#ip rip work
SWITCHB (config-If-vlan1)#exit
SWITCHB(config)#exit
SWITCHB#

c) layer 3 SWITCHC
configure IP address of vlan2
SWITCHC#config
SWITCHC(config)# interface vlan 2
SWITCHC(config-If-vlan2)# ip address 20.1.1.2 255.255.255.0
SWITCHC (c config-If-vlan2)#exit
Enable RIP protocol
SWITCHC(config)#router rip
SWITCHC(config-router-rip)#exit
Enable vlan2 to transmit or receive RIP datagram
SWITCHC(config)#interface vlan 2
SWITCHC (config-If-vlan2)#ip rip work
SWITCHC (config-If-vlan2)exit
SWITCHC(config)#exit
SWITCHC#

13.3.4 RIP troubleshooting help

1. monitoring and debugging command
2. RIP troubleshooting help

13.3.4.1 monitoring and debugging command

Command	explanation
Authorized mod e	
show ip rip	Show RIP currently operation status and configuration information. According to the output information, user can ensure if configuration is right and perform RIP trouble diagnosis
show ip route	show routing table information and check related RIP routing information
show ip protocols	Show protocol information
[no] debug ip rip packet	Show all received and transmitted RIP datgram
[no] debug ip rip recv	Show all received RIP datgram

[no] debug ip rip send	Show all transmitted RIP datgram

1) show ip rip

showing information:

RIP information:

Automatic network summarization is not in effect.

default metric for redistribute is :16

neigbour is :NULL

preference is :100

Explanation:

Showing contents	explanation
Automatic network summarization is not in effect	RIP auto-aggregation function is disabled
default metric for redistribute is :16	default redistributed routing value is 16
neigbour is	sending destination address at a fixed place
preference is :100	RIP routing priority is 100

2) show ip route

use this command to show destination IP address, network mask and the next hop IP address or forwarding interface, etc of RIP routes in routing table

example: showing information are as follows:

Switch#show ip route

Total route items is 2, the matched route items is 2

Codes: C - connected, S - static, R - RIP derived, O - OSPF derived

A - OSPF ASE, B - BGP derived, D - DVMRP derived

	Destination	Mask	Nexthop	Interface	Pref
C	2.2.2.0	255.255.255.0	0.0.0.0	vlan1	0
R	7.7.7.0	255.255.255.0	2.2.2.8	vlan2	100

R means RIP routing, itd destination network address is 7.7.7.0, network mask is 255.255.255.0, next hop address is 2.2.2.8 and forwarding interface is vlan2; its priority is 100

3) show ip protocols

use this command to show currently operating routing protocol information of layer 3 switch

example: showing information is as follows

Switch#sh ip protocols

RIP information:

Automatic network summarization is not in effect.

default metric for redistribute is :16

neigbour is:NULL

preference is :100

RIP version information is:

interface	send version	receive version
vlan1	V2BC	V12
vlan2	V2BC	V12
vlan3	V2BC	V12

Switch#

Showing contents	explanation
Automatic network summarization is not in effect	disable RIP auto-aggregation function
default metric for redistribute is :	default metric value of RIP protocol
neigbour is:	address of the layer 3 switch which is neighbor of local RIP layer 3 switch
Preference	OSPF routing priority
RIP version information	Showing version information of operating RIP protocol, including sending RIP version (V1 means RIP-I, V2 means RIP-II), RIP sending mode (BC means broadcast, MC means multicast), receiveing RIP version (V1 means RIP-I, V2 means RIP-II, V12 means receiving RIP-I and RIP-II at the same time)

13.3.4.2 RIP troubleshooting help

On RIP protocol configuration and application, RIP protocol might not be able to operate normally due to physical connection errors, configuration errors. So user should pay attention to the following points:

- ✧ first, ensure all physical connection is right
- ✧ second, ensure port and link protocols are UP (use show interface command)
- ✧ third, enable RIP protocol (use router rip command), configure RIP protocol parameters in corresponding ports, such as enable RIP-I or RIP-II, etc
- ✧ next, please pay attention to the feature of RIP protocol—RIP layer 3 switch send routing table updated information to its neighbor layer 3 switch every 30 seconds. If do not receive information from a layer 3 switch for 180s, we think this layer 3 switch is broken or its network is unavailable, but his layer 3 switch routes will exist in routing table for 120s, then delete it. So if delete a RIP route, we should wait for 30s to ensure it has been deleted.

If RIP routing problem still exist after above 4 troubleshooting steps, we can use debug ip rip command, and copy the DEBUG information in 3 minutes and send it to KYLAND technical service center.

13.4 OSPF

13.4.1 OSPF configuration

OSPF configuration of KYLAND series layer 3 switch has its own feature, including two steps: 1. Enable OSPF in global 2. Configure OSPF filed in interface. It is different from other manufacturers

13.4.1.1 Task sequence of OSPF protocol (mandatory)

1. enable OSPF protocol (mandatory)

1) enable /disable OSPF protocol (mandatory)

2) configure ID number of operating OSPF layer 3 switch (optional)

3) configure network range of operating OSPF (optional)

4) configure interface domain (mandatory)

2. configure OSPF assistant parameter (optional)

1) configure OSPF transmitting packet mechanism

a) configure authentication of OSPF data packets

b) configure OSPF interface to receive

c) configure the cost of interface transmitting data packets
d) configure OSPF transmitting packet timer parameter (broadcast interface poll transmitting timer of HELLO data packets, invalid timer of neighbor layer 3 switch, delay timer of interface transmitting LSA, timer of neighbor layer 3 switch retransmitting LSA)
2) configure OSPF redistributed routing parameter
a) configure default parameters of redistributed external routing (default type, default identifier value, default cost value, default time interval and default number limit)
b) configure redistributed other protocol routing in OSPF
3) configure OSPF protocol other parameters
a) configure OSPF routing protocol priority
b) configure OSPF STUB area and default routing cost
c) configure OSPF virtual link
d) configure the port priority in electing specified layer 3 switch DR
3. disable OSPF protocol

1. enable OSPF protocol

the basic configuration of operating OSPF routing protocol in KYLAND series layer 3 switch is simple. Generally, user only neends to turn on OSPF switch, configure OSPF domain of interface. OSPF protocol parameters are default values. If it need to modify OSPF protocol parameter value, please refer to 2 to configure OSPF assistant parameters

Command	explanation
Global configuration mode	
[no] router ospf	enable OSPF protocol; no command is to disable OSPF protocol (mandatory)
router id <*router_id*> **no router id**	configure ID number of layer 3 switch operating OSPF protocol; no command is to delete layer 3 switch ID number. Select a port IP address to be layer 3 switch ID at default (optional)
OSPFprotocol configuration mode	
[no] network <*network*> <*mask*> area <*area_id*> [advertise | notadvertise]	define several segments in a domain to be a network range; no command is to delete network range (optional)
Interface configuration mode	
ip ospf enable area <*area_id*> **no ip ospf enable area**	configure a interface to a domain; no command is to delete the configuration (mandatory)

2. configure OSPF assistant parameters

1) configure OSPF transmitting packets mechanism parameters
   a) configure authentication of OSPF data packets
   b) configure OSPF interface to receive, not transmit
   c) configure the cost of interface transmitting data packets

Command	explanation
interface configuration mode	

ip ospf authentication { simple <*auth_key*>| md5 <*auth_key*> <*key_id*>} **no ip ospf authentication**	Configrue authentication mode and authentication key of receving OSPF data packets; no command is to restore default value
[no] ip ospf passive-interface	Configrue a port to receive, not to transmit; no command is to delete configuration
ip ospf cost <*cost* > **no ip ospf cost**	Specify the cost of interface operating OSPF protocol; no command is to restore default value of cost

d) configure OSPF transmitting packets timer parameter ((broadcast interface poll transmitting timer of HELLO data packets, invalid timer of neighbor layer 3 switch, delay timer of interface transmitting LSA, timer of neighbor layer 3 switch retransmitting LSA)

Command	explanation
Interface configuration mode	
ip ospf hello-interval <*time*> **no ip ospf hello-interval**	Configrue the time interval of interface regularly sending HELLO data packets; no command is to restore default value
ip ospf dead-interval <*time* > **no ip ospf dead-interval**	Configrue the time interval of identifying neighbor layer 3 switch invalid; no command is to restore default value
ip ospf transmit-delay <*time*> **no ip ospf transmit-delay**	Set the dealy value of transmitting link state broadcast in the interface; no command is to restore default vaule
ip ospf retransmit <*time*> **no ip ospf retransmit**	Configure the retransmitting interval of informing link status of interface and neighbor layer 3 switch; no command is to restore default value

2) configure OSPF redistributed routing parameters

a) configure default parameter of redistributed external routing (default type, default identifier value, default cost value, default time interval and default number limit)

Command	explanation
OSPF protocol configuration mode	
default redistribute type { 1 | 2 } **no default redistribute type**	Configure default type of OSPF redistributed external routing; no command is to restore default type
default redistribute tag <tag> **no default redistribute tag**	Configure default identifier value of OSPF redistributed external routing; no command is to cancel the identifier value
default redistribute cost <cost> **no default redistribute cost**	Configure default cost value of OSPF redistributed external routing; no command is to cancel the cost value
default redistribute interval <*time*> **no default redistribute interval**	Configure time interval of OSPF redistributed external routing; no command is to restore default value

default redistribute limit <*routes*> **no default redistribute limit**	Configure the number limit of OSPF redistributed routing; no command is to restore default value

b) configure OSPF redistributed other protocol routing

Command	解释
OSPF protocol configuration mode	
redistribute ospfase { bgp | connected | static | rip} [type { 1 | 2 }] [tag <*tag*>] [metric <*cost_value*>] **no redistribute ospfase { bgp | connected | static | rip }**	Redistributed BGP routing, direct-conencted routing, static routing and RIP routing as external routing information; no command is to delete redistributed external routing information

3) configure other parameter of OSPF protocol

a) configure OSPF routing protocol priority

b) configure OSPF STUB domain and the cost of default routing

c) configure OSPF virtual link

Command	explanation
OSPFprotocol configuration mode	
preference [ase] <*preference* > **no preference [ase]**	Configure the priority of OSPF protocol in various routing protocols, and the priority of redistributed external routing; no command is to restore default value
stub cost <*cost*> area <*area_id* > **no stub area <area_id >**	Define an area to be a stub area; no command is to cancel STUB area
virtuallink neighborid <*router_id*> transitarea <*area_id*> [hellointerval <*time*>] [deadinterval <*time*>] [retransmit <*time*>] [transitdelay <*time*>] **no virtuallink neighborid <*router_id*> transitarea <*area_id*>**	Create and configure virtual link; no command is to delete a virtual link

d) configure the port priority of electing specified layer 3 switch DR

Command	explanation
Interface configuration mode	
ip ospf priority <*priority*> **no ip ospf priority**	Configure interface priority of electing specified switch; no command is to restore default value

3. disable OSPF protocol

Command	explanation
Global configuration mode	
no router ospf	Disable OSPF routing protocol

13.4.1.2 OSPF configuration commands

- **default redistribute cost**
- **default redistribute interval**

- **default redistribute limit**
- **default redistribute tag**
- **default redistribute type**
- **ip opsf authentication**
- **ip ospf cost**
- **ip opsf dead-interval**
- **ip ospf enable area**
- **ip ospf hello-interval**
- **ip ospf passive-interface**
- **ip ospf priority**
- **ip ospf retransmit-interval**
- **ip ospf transmit-delay**
- **network**
- **preference**
- **redistribute ospfase**
- **router id**
- **router ospf**
- **stub cost**
- **virtuallink neighbored**

13.4.1.2.1 default redistribute cost

Command: **default redistribute cost <*cost*>**

no default redistribute cost

Function: configure default cost value when OSPF redistributing external routing; no command is to restore default value

Parameter: is cost value in a range of 1~65535

Default: cost value of redistribution is 1

Command mode: OSPF protocol configuration mode

User guide: when OSPF routing protocol redistribute routes found our by other routing protocol, these routing information is look as system external routing information. Redistributing external routing information needs some additional [arameter, such as routing default cost and default identifier, etc. user can use this command to set reasonable default cost vuale according to actual situation when redistribute external routing

Example: set the default cost value to 20 when OSPF redistributing external routing

Switch(Config-Router-Ospf)#default redistribute cost 20

13.4.1.2.2 default redistribute interval

Command: **default redistribute interval <*time*>**

no default redistribute interval

Function: configure time interval of OSPF redistributing external routing; no command is to restore default value

Parameter: **<*time*>** is the time interval of redistributing external routing with a unit of second and in a range of 1~65535

Default: the default time interval of OSPF redistributing external routing is 1s

Command mode: OSPF protocol configuration mode

User guide: OSPF will regularly redistribute external routing information and broadcast this routing information in whole system. This command is used to modify time interval of redistribution external routing information
Example: the time interval of OSPF redistributing external routing is 3s
Switch(Config-Router-Ospf)#default redistribute interval 3

13.4.1.2.3 default redistribute limit

Command: **default redistribute limit <*routes*>**
no default redistribute limit
Function: configure the max number of OSPF redistributing external routings each time; no command is to restore default value
Parameter: **<*routes*>** is the is the max number of redistributing routings in a range of 1~65535
Default: the max default number of OSPF redistritbuting external routings is 100
Command mode: OSPF protocol configuration mode
User guide: OSPF will regularly redistribute external routing information and broadcast htem to whole system. This command specify the max number of redistributing external routing information each time
Example: set the max quantity of OSPF redistributing external routings each time to 110
Switch(Config-Router-Ospf)#default redistribute limit 110

13.4.1.2.4 default redistribute tag

Command: **default redistribute tag <*tag*>**
no default redistribute tag
Function: configure default tag value when redistributing external routings; no command is to restore default value
Parameter: **<*tag*>** is tag value in a range of 0～4294967295
Default: default value is 0
Command mode: OSPF protocol configuration mode
User guide: when OSPF routing protocol redistribute routings which are found out by other routing protocols, these routing information is look as system external routing information. Redistributing external routing nees additional parameters, such as routing default cost and default tag, etc. use this command provides routing ag protocol information.
Example: set the default tag value of OSPF redistributing external routing is 20000
Switch(Config-Router-Ospf)#default redistribute tag 20000

13.4.1.2.5 default redistribute type

Command : **default redistribute type { 1 | 2 }**
no default redistribute type
FunctionL: configure default type of redistributing external routing; no command is to restore default value
Parameter: **1 | 2** means first type of external routing and second type of external routing
Default: the redistributed external routing at default is the second type of external routing
Command mode: OSPF protocol configuration mode
User guide: OSPF set a rule about cost selecting types of two types of external routing information: the first type of external routing and the second type of external routing.
Example: set the default type of OSPF redistributing external routing to type1

Switch(Config-Router-Ospf)#default redistribute type 1

13.4.1.2.6 ip ospf authentication

Command: **ip ospf authentication { simple <*auth_key*>| md5 <*auth_key*> <*key_id*>}**
no ip ospf authentication
Function: specify the authentication mode of interface receiving OSPF message; no command is to cancel authentication
Parameter: **simple** means simple authentication mode with max 8 characters, **md5** means MD5 encryption authentication mode with max 16 characters, ***<auth_key>*** is authentication key which is a continuous string; ***<key_id>*** is authentication number of MD5 authentication mode in a range of 1~255
Default: interface receive OSPF meaage without the need of authentication
User guide: key value will be wrote in OSPF message to ensure OSPF meaage normal transmission and receiveing between nerghbor layer 3 switches
Example: configure MD5 authentication mode in OSPF vlan1, and the authentication password is 123abc
Switch(Config-If-Vlan1)#ip ospf authentication md5 123abc 1

13.4.1.2.7 ip ospf cost

Command: **ip ospf cost *<cost>***
no ip ospf cost
Function: specify the cost of interface operating OSPF protocol; no command is to restore defult value
Parameter: ***<cost >*** is the cost vaule of OSPF protocol in a range of 1~65535
Default: the cost value of OSPF protocol is 1
Command mode: interface configuration mode
Example: configure OSPF routing cost of vlan1 to 3
Switch(Config-If-Vlan1)#ip ospf cost 3

13.4.1.2.8 ip ospf dead-interval

Command: **ip ospf dead-interval *<time >***
no ip ospf dead-interval
Function: specify the invalid interval of routing between neighbor layer 3 switch; no command is to restore default value
Parameter: ***<time >*** is the invalid interval of neighbor layer 3 switch with a unit of second and in a range of 1~65535
Deafult: the default invalid interval is 40s (generally, it is 4 times of hello-interval)
Command mode: interface configuration mode
User guide: when layer 3 switch do not receive HELLO data packets from neighbor layer 3 switch in dead-interval, this layer 3 switch is look as unreachable, invalid. This command can modify the invalid interval of neibor switches according to actual link situation. Write the vaule of dead-interval to HELLO message and transmitted with Hello message. In order to let OSPF protocol work normally, please ensure the dead-interval parameters of neighbor layer 3 switches are the same, at leastm it is 4 times of hello-interval.
Example: set OSPF routing invalid interval of vlan1 to be 80s
Switch(Config-If-Vlan1)#ip ospf dead-interval 80

13.4.1.2.9 ospf enable area

Command: **ip ospf enable area *<area_id>***

no ip ospf enable area

Function: configure a port to belong to a OSPF area; no command is to delete this configuration

Parameter: ***<area_id>*** is the area number of the port in a range of 0～4294967295

Default: port does not be configured to belong to a area

Command mode: interface configuration mode

User guide: before operating OSPF protocol in a port, specify the port belonging to a area

Example: vlan1 belong to area 1

Switch(Config-If-Vlan1)#ip ospf enable area 1

13.4.1.2.10 ip ospf hello-interval

Command: **ip ospf hello-interval *<time>***

no ip ospf hello-interval

Function: apecify interval of interface transmitting HELLP message; no command is to restore default value

Parameter: ***<time>*** is the interval of sending HELLO message with the unit of second and in a range of 1~255

Default: the interval of interface sending HELLO message is 10s

Command mode: interface configuration mode

User guide: HELLO data packets are the most often seen data packets which are regularly transmitted to neighbor layer 3 switch to find out and maintain neighborhood relationship, elect DR and BDR. Hello-interval value set by user are written into HELLO message and are transmitted with HEELO message. The less of the hello-interval value, the changes on network topologies are sooner to be find out, meanwhile the routing cost also increases. In order to let OSPF protocol work normally, please ensure the hello-interval of neighbor switches are the same

Example: configure the interval of vlan1 transmitting HELLO message to 20s

Switch(Config-If-Vlan1)#ip ospf hello-interval 20

Related Command: **ip ospf dead-interval**

13.4.1.2.11 ip ospf passive-interface

Command: **ip ospf passive-interface**

no ip ospf passive-interface

Function: set the interface to only receive OSPF message, not transmit; no command is to delete this configuration

Default: receiving and transmitting OSPF message

Command mode: interface configuration mode

Example: configure vlan1 to receive OSPF message

Switch(Config-If-Vlan1)#ip ospf passive-interface

13.4.1.2.12 ip ospf priority

Command: **ip ospf priority *<priority>***

no ip ospf priority

Function: configure the interface priority when electing “specified layer 3 switch” (DR); no command is to restore default value.

Parameter: ***<priority>*** means priority in a range of 0~255
Default: interface priority is 1 when electing specified layer 3 switch
Command mode: interface configuration mode
User guide: when two layer 3 swotches in a same segment both want to be "specified layer 3 switch", according to priority value to decide which one to be "specified layer 3 switch", and generally the switch with higher priority will be selected. If priorities are the same, the switch with bigger router-id will be selected. When a layer 3 switch priority is 0, this switch won't be elected to "specified layer 3 switch" or "backup specified layer 3 switch".
Example: configure interface priority when electing specified layer 3 switch (DR). Configure the priority of vlan1 to be 0, it has no right to be elected.
Switch(Config-If-Vlan1)#ip ospf priority 0

13.4.1.2.13 ip ospf retransmit-interval

Command: **ip ospf retransmit-interval *<time>***
no ip ospf retransmit-interval
Function: set the retransmitted interval of sending Link-State Advertisement (LSA) between interface and its neighbor layer 3 switch; no command is to restore default value
Parameter: ***<time>*** is the retransmitted interval of sending Link-State Advertisement (LSA) between interface and its neighbor layer 3 switch; the unit is second; it is in a range of 1~65535.
Default: retransmitted interval is 5s
Command mode: interface configuration mode
User guide: when a layer 3 switch transmit LSA to its neighbor, it will keep its LSA until receive confirmation from its neighbor. If it does not receive confirmation message in the interval, layer 3 switch will retrsansmit LSA. The retransmitted interval should be longer than the time of a message is to and fro between two switches.
Example: set the interval of vlan1 retransmitting LSA to 10s
Switch(Config-If-Vlan1)#ip ospf retransmit 10

13.4.1.2.14 ip ospf transmit-delay

Command: **ip ospf tranmsit-delay *<time>***
no ip ospf transmit-delay
Function: set the delay value of interface uploading Link-State Advertisement (LSA); no command is to restore default value
Parameter: ***<time>*** is the delay valute of interface uploading Link-State Advertisement (LSA) with the unit of second and in a range of 1~65535
Default: the default delay value of interface uploading Link-State Advertisement (LSA) is 1s
Command mode: interface configuration mode
User guide: LSA will become aging in layer 3 switch, but won't become aging in network transmission process, so add transmit-delay before sending LSA to let it be trsnmitted before aging.
Example: set the trsnmit-delay of vlan1 sending LSA to 2s
Switch(Config-If-Vlan1)#ip ospf transmit-delay 2

13.4.1.2.15 network

Command: **network *<network>* *<mask>* area *<area_id>* [advertise | notadvertise]**
no network *<network>* *<mask>* area *<area_id>*
Function: define the area for for each network of layer 3 switch; no command is to delete this

configuration

Parameter: ***<network>*** and ***<mask>*** are network IP address and address wildcard with dot-decimal format; ***<area_id>*** is a area number in a range of 0～4294967295; **ad: vertise | notadvertise** specify if broadcast brief information of routing in this network range

Default: do not configure network area. If it is configured, it is look as broadcast brief information.

Command mode: OSPF protocol configuration mode

User guide: if add a network range to area, all network internal routes won't be independently brocasted to other area, but broadcast the brief information of a network range routing. Network range and range limit is to reduce the communication amount routing information between areas.

Example: define the network range 10.1.1.0 255.255.255.0 and enter to area 1

Switch(Config-Router-Ospf)#network 10.1.1.0 255.255.255.0 area 1

13.4.1.2.16 preference

Command: **preference [ase] *<preference >***

no preference [ase]

Function: configure OSPF protocol's priority in routing protocols and autonomous system external routing's priority; no command is to restore default value

Parameter: **ase** means the priority of autonomous system external routings, ***<preference >*** is the priority value in a rang of 1～255

Default: the default priority of OSPF protocol is 10 and the default priority of external routing protocol is 150

Command mode: OSPF protocol configuration mode

User guide: Because multi dynamic routing protocols can be operated in layer 3 switch in the same time, there is a problem of information sharing and selection between various routing protocols. We need to specify a default priority for each routing protocol. When different protocols find out a routing, the protocol with higher priority has a decisive effect. After changing priority, it start to take effect on new routing. Depending on OSPF characteristics, the priority of OSPF should not be too low.

Example: set the priority when OSPF bring in ase routing

Switch(Config- Router-Ospf)#preference ase 20

13.4.1.2.17 redistribute ospfase

Command: **redistribute ospfase { bgp |connected | static | rip} [type { 1 | 2 }] [tag *<tag>*] [metric *<cost_value>*]**

no redistribute ospfase { bgp |connected | static | rip}

Function: bring in bgp routing, direct connected routing, static routing and RIP routing to be external routing information; no command is to cancel these external routing information

Parameter: **bgp** means bringing in BGP routing to be external routing information; **connected** means bringing in direct connected routing to be external routing information; **static** means bringing in static routing to be external routing information; **rip** means bringing in RIP routing to be external routing information; **type** is to specify routing types; **1 | 2** respectively indicate external routing type 1 and type 2; **tag** is to specify routing marks; ***<tag>*** is the value of routing mark in a range of; **metric** means routing value; ***<cost_value>*** is the value of routing in a range of 1～16777215.

Default: OSPF does not bring in external routing

Command moe: OSPF protocol configuration mode

User guide: routing information between various dynamic routing protocols of layer 3 switch can be shared. Due to the characteristics of OSPF, routings which other routing protocols find out will be processed as autonomous system external routing information

Example: bring in RIP routing to be external routing type 1 in OSPF routing with mark value of 3 and cost value of 20

Switch(Config-Router-Ospf)#redistribute ospfase rip type 1 tag 3 metric 20

13.4.1.2.18 router id

Command: **router id *<router_id>***

no router id

Function: configure the ID number of layer 3 switch operating OSPF protocol; no command is to cancel layer 3 switch ID number

Parameter: ***<router_id>*** is layer 3 switch ID number with dot-decimal format

Default: at default, system does not set layer 3 switch ID number; select a port IP address when operating protocol to be layer 3 switch ID

Command mode: global configuration mode

User guide: when OSPF protocol is under operation, layer 3 switch ID number serves as unique mark of layer 3 switch in the autonomous system; generally select a port IP address which operate OSPF protocol to be ID number. At default, SICOM6496 layer 3 switch use the IP address of the port which is UP at first to be router id. If all ports in layer 3 switch do not have IP address, use this command to specify layer 3 switch ID number, otherwise OSPF protocol can't be operated. The changing of layer 3 switch ID number will take effect after OSPF reset.

Example: specify layer 3 switch ID to be 10.1.120.1

Switch(Config)#router id 10.1.120.1

13.4.1.2.19 router ospf

Command: **router ospf**

no router ospf

Function: enable OSPF protocol and enter OSPF mode; no command is to disable OSPF protocol

Default: do not operate OSPF protocol

Commond mode: global configuration mode

User guide: use this command to enable or disable OSPF protocol. all OSPF configuration will take effect after system operating OSPF

Example: configure this switch to operate OSPF

Switch(Config)#router ospf

13.4.1.2.20 stub cost

Command: **stub cost *<cost>* area *<area_id >***

no stub area *<area_id >*

Function: define a area to be STUB area; no command is to delete this definition

Parameter: ***<cost>*** s the cost value of default routing in stub area in a range of 1~65535; ***<area_id >*** s the number of stub area in a range of 1～4294967295

Default: there is not STUB area

Command mode: OSPF protocol configuration mode

User guide: when the area only has one exit point (it connect with a layer switch), or it is unnecessary for the area to select exit point for each external destination, this area can be configured

to be STUB area. In STUB area, type 4LSA and 5LSA are not allowed to overflow enter or pass through, which can save the resource of layer 3 switches in this area process external routing information
Example: set area 1 to be STUB area and the cost of default routing is 60
Switch(Config-Router-Ospf)#stub cost 60 area 1

13.4.1.2.21 virtuallink neighborid

Command: **virtuallink neighborid *<router_id>* transitarea *<area_id>* [hellointerval *<time>*] [deadinterval *<time>*] [retransmit*<time>*] [transitdelay *<time>*]**

no virtuallink neighborid *<router_id>* transitarea *<area_id>*

Function: create a virtual link; no command is to delete a virtual link
Parameter: ***<router_id>*** is the ID of virtual link neighbor with dot-decimal format; ***<area_id>*** is the Transit area number in a range of ; other four items is to select the parameter of time interval and other configuration
Default: no virtual link
Command mode: OSPF protocol configuration mode
User guide: virtual link is to achieve and enhance connectivity of backbone area (area 0). Backbone area must keep connectivity in logic, so is if there is not a area internal routing between two nodes of backbone area, create a virtual link in Transit area between two nodes. Virtual link is identified by the ID number of the layer 3 switch at the other side. The area which provides a non-backbone area internal routng for virtual link is called transit area and the area number must be specified in configuration
The virtual is activated after it is calculated by routing in transit area, which is equivalent to the point-to –point connection, so in this virtual link, we can configure parameters of ports the same as physical port, such as the HELLO interval
Example: configure the virtual link of passing through area 2 and reach 11.1.1.1
Switch(Config-Router-Ospf)#virtuallink neighborid 11.1.1.1 transitarea 2

13.4.2 OSPF Typical example

Example 1: OSPF autonomous system
Use 5 units of SICOM6496 to form a OSPF autonomous system; SWITCH1 and SWITCH5 form OSPF area 0; SWITCH2 and SWITCH3 form OSPF area 1 (set the vlan1 of SWITCH1 to be a member of area 0); SWITCH 4 forms OSPF area 2 (set vlan2 of SWITCH5 to be a member of area 0); SWITCH1 and SWITCH5 are backbone layer 3 switch, SWITCH2 and SWITCH4 are area boundary layer 3 switches and SWITCH3 is area internal layer 3 switch.

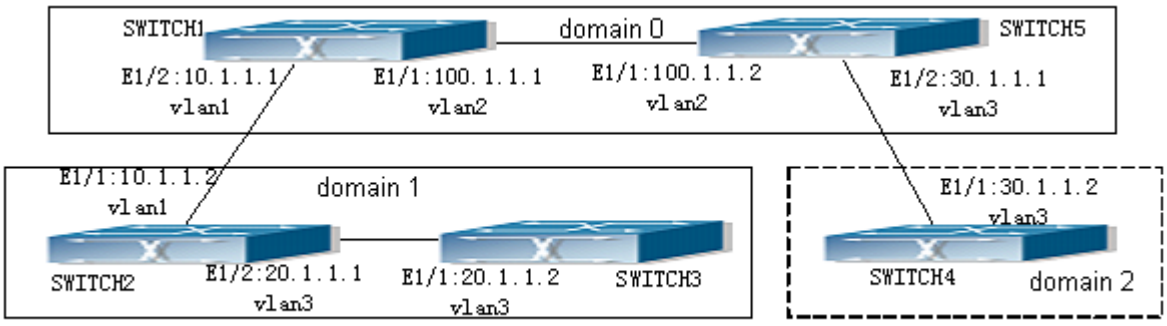


Figure 13-3 network topology of OSPF autonomous system

the configurations of SWITCH1 to SWITCH5 are as follows:
SWITCH1：

Configure IP address of vlan1
SWITCH1#config
SWITCH1(config)# interface vlan 1
SWITCH1(config-if-vlan1)# ip address 10.1.1.1 255.255.255.0
SWITCH1(config-if-vlan1)#no shut-down
SWITCH1(config-if-vlan1)#exit

configure IP address of vlan2:
SWITCH1(config)# interface vlan 2
SWITCH1(config-if-vlan2)# ip address 100.1.1.1 255.255.255.0
SWITCH1 (config-if-vlan2)#exit

enable OSPF protocol, configure area number of vlan1 and vlan2
SWITCH1(config)#router ospf
SWITCH1(config-router-ospf)#exit
SWITCH1(config)#interface vlan 1
SWITCH1 (config-if-vlan1)#ip ospf enable area 0
SWITCH1 (config-if-vlan1)#exit
SWITCH1(config)#interface vlan2
SWITCH1 (config-if-vlan2)#ip ospf enable area 0
SWITCH1 (config-if-vlan2)#exit
SWITCH1(config)#exit
SWITCH1#

SWITCH2：
Configrue IP address of vlan1 and vlan2
SWITCH2#config
SWITCH2(config)# interface vlan 1
SWITCH2(config-if-vlan1)# ip address 10.1.1.2 255.255.255.0
SWITCH2(config-if-vlan1)#no shut-down
SWITCH2(config-if-vlan1)#exit
SWITCH2(config)# interface vlan 3
SWITCH2(config-if-vlan3)# ip address 20.1.1.1 255.255.255.0
SWITCH2(config-if-vlan3)#no shut-down
SWITCH2(config-if-vlan3)#exit

enable OSPF protocol, configure OSPF area of vlan1 and vlan3
SWITCH2(config)#router ospf
SWITCH2(config-router-ospf)#exit
SWITCH2(config)#interface vlan 1
SWITCH2(config-if-vlan1)#ip ospf enable area 0
SWITCH2(config-if-vlan1)#exit
SWITCH2(config)#interface vlan 3

```
SWITCH2(config-if-vlan3)#ip ospf enable area 1
SWITCH2(config-if-vlan3)#exit
SWITCH2(config)#exit
SWITCH2#
```

SWITCH3：

Configure IP address of vlan3

```
SWITCH3#config
SWITCH3(config)# interface vlan 3
SWITCH3(config-if-vlan1)# ip address 20.1.1.2 255.255.255.0
SWITCH3(config-if-vlan3)#no shut-down
SWITCH3(config-if-vlan3)#exit
```

enable OSPF protocol, configure OSPF area of vlan3

```
SWITCH3(config)#router ospf
SWITCH3(config-router-ospf)#exit
SWITCH3(config)#interface vlan 3
SWITCH3(config-if-vlan3)#ip ospf enable area 1
SWITCH3(config-if-vlan3)#exit
SWITCH3(config)#exit
SWITCH3#
```

SWITCH4：

Configure IP address of vlan3

```
SWITCH4#config
SWITCH4(config)# interface vlan 3
SWITCH4(config-if-vlan3)# ip address30.1.1.2 255.255.255.0
SWITCH4(config-if-vlan3)#no shut-down
SWITCH4(config-if-vlan3)#exit
```

enable OSPF protocol, configure OSPF area of vlan3

```
SWITCH4(config)#router ospf
SWITCH4(config-router-ospf)#exit
SWITCH4(config)#interface vlan 3
SWITCH4(config-if-vlan3)#ip ospf enable area 0
SWITCH4(config-if-vlan3)#exit
SWITCH4(config)#exit
SWITCH4#
```

SWITCH5：

Configure IP address of vlan2

```
SWITCH5#config
SWITCH5(config)# interface vlan 2
SWITCH5(config-if-vlan2)# ip address 30.1.1.1 255.255.255.0
```

SWITCH5(config-if-vlan2)#no shut-down
SWITCH5(config-if-vlan2)#exit

configure IP address of vlan3
SWITCH5(config)# interface vlan 3
SWITCH5(config-if-vlan3)# ip address 100.1.1.2 255.255.255.0
SWITCH5(config-if-vlan3)#no shut-down
SWITCH5(config-if-vlan3)#exit

enable OSPF protocol, configure area number of vlan2 and vlan3
SWITCH5(config)#router ospf
SWITCH5(config-router-ospf)#exit
SWITCH5(config)#interface vlan 2
SWITCH5(config-if-vlan2)#ip ospf enable area 0
SWITCH5(config-if-vlan2)#exit
SWITCH5(config)#interface vlan 3
SWITCH5(config-if-vlan3)#ip ospf enable area 0
SWITCH5(config-if-vlan3)#exit
SWITCH5(config)#exit
SWITCH5#

13.4.3 OSPF troubleshooting help

1. Monitoring and debugging command
2. OSPF troubleshooting help

13.4.3.1 monitoring and debugging commands

Command	explanation
privilege user configuration mode	
Show interface	Show interface information and ensure the interface and link layer protocols are UP
Show ip ospf	Show current OSPF operation status and configuration information. According to the output information, use can confirm if the configuration is right and operate OSPF fault diagnosis
Show ip route	show routing table information and check information about OSPF routing
Show ip ospf ase	Show OSPF enternal routing information
Show ip ospf cumulative	Show OSPF statistical information
Show ip ospf database	Show database information of OSPF connection status
Show ip ospf interface	Show configured OSPF information for specified port
Show ip ospf neighbor	Show OSPF neighbor information
Show ip ospf routing	Show OSPF routing table information

Show ip ospf virtual-links	Show OSPF virtual link information
Show ip protocols	Show operating routing protocol information
[no] debug ip ospf event	Debug information of various OSPF events; no command is to disable debugging switch
[no] debug ip ospf lsa	Debug information of LSA; no command is to turn off debugging switch
[no] debug ip ospf packet	Debug information of OSPF datagram; no command is to turn off debugging switch
[no] debug ip ospf spf	Debug spf information; no command is to disable debugging switch

1) show ip ospf

example:

Switch#show ip ospf

OSPF information:

my router ID is 11.11.4.1

preference=10 ase perference=150

export metric=1

export tag=-2147483648

area ID 0

interface count：1

80times spf has been run for this area

net range：

LSRefreshTime is1800

area ID 1

interface count：1

41times spf has been run for this area

net range：

netid11.11.3.255 netaddress11.11.0.0 netmask255.255.252.0

LSRefreshTime is1800

Showing contents	explanation
my router ID	layer 3 switch ID
preference	priority of routing protocol
ase perference	priority of external routing brought in
export metric	the number of hops of interface exporting
export tag	routing tags of port exporting
area ID interface count imes spf has been run for this area net range	OSPF area number,inclucing statistics of the number of ports in area, the number of arithmetic of SPF algorithm, network range, etc

2) show ip route

use this command to shoe destination IP address, network mask and the next hop IP adderess and forwarding interface, etc information of OSPF routing in routing table

for example: showing information is as follows:

Switch#show ip route

Total route items is 4018, the matched route items is 4018
Codes: C - connected, S - static, R - RIP derived, O - OSPF derived
A - OSPF ASE, B - BGP derived, D - DVMRP derived

	Destination	Mask	Nexthop	Interface	Preference
C	4.1.140.0	255.255.255.0	0.0.0.0	Vlan2139	0
A	5.1.1.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.2.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.3.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.4.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.5.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.6.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.7.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.8.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.9.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.10.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.11.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.12.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.13.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.14.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.15.0	255.255.255.0	12.1.1.2	Vlan12	150
A	5.1.16.0	255.255.255.0	12.1.1.2	Vlan12	150
O	5.1.17.0	255.255.255.0	12.1.1.2	Vlan12	110

---More---

O means OSPF routing with destination network address of 5.1.17.0, network mask of 255.255.255.0, the next hop address of 12.1.1.2 and forwarding interface of vlan12 and priority of 110

3) show ip ospf ase

use this command to show information about OSPF autonomous system external routing

Switch#show ip ospf ase

Destination	AdvRouter	NextHop	Age	SeqNumber	Type	Cost
10.1.1.125	11.11.1.2	11.1.1.2	3	300	1	20

Showing contents	Explanation
Destination	destination segment or address
AdvRouter	Electing routing
NextHop	the next hop address
Age	aging time
SeqNumber	series number
Type	the type of external routing brought in
Cost	The cost of bringing in external routing

4) show ip ospf cumulative

use this command to show statistical information about OSPF routing protocols

For example: the showing information is as follows:

Switch#show ip ospf cumulative

IO cumulative
type in out
HELLO 1048 253
DD 338 337
LS Req 62 219
LS Update 753 295
LS Ack 495 308
ASE count 0 checksum 0
original LSA 340 LS_RTR 179 LS_NET 1 LS_SUM_NET 160 LS_SUM_ASB 0 LS_ASE 0
received LSA 325
Areaid 0
nbr count 1 interface count 1
spf times 120
DB entry count 6
LS_RTR 2 LS_NET 2 LS_SUM_NET 3 LS_SUM_ASB 0 LS_ASE 3
Areaid 1
nbr count 2 interface count 1
spf times 52
DB entry count 6
LS_RTR 3 LS_NET 3 LS_SUM_NET 1 LS_SUM_ASB 0 LS_ASE 3
AS internal route 4 AS external route 0

Showing contemts	explanation
IO cumulative	the statistics of input and output OSPF data packets
type	the type of data packets, including hello message, DD message, LS requests, updated, packet confirmation, etc
In	statistics of input
Out	statistics of output
Areaid	OSPF data statistics of a OSPF area

5) show ip ospf database

use this command to show all connection status database information about OSPF routing protocol for example: showing information is as follows

Switch#show ip ospf database
OSPF router ID:1.1.1.60 AS:No
Area 1 >>>>>>>> Area ID: 0
Router LSAs
==========
LS ID(Router ID): 1.1.1.30 ADV rtr: 1.1.1.30 Age: 512 Where: 1
Sequence: 0x80000066 Cost: 0x1 Checksum: 0x72b1

Type: Transit net Cost: 1
DR: 2.2.2.60 Address: 2.2.2.30

Type: Stub net Cost: 1

Network: 6.6.6.0 NetMask: 255.255.255.0

LS ID(Router ID): 1.1.1.60 ADV rtr: 1.1.1.60 Age: 506 Where: 2
Sequence: 0x80000060 Cost: 0x0 Checksum: 0x1bc3

Type: Stub net Cost: 1
Network: 1.1.1.0 NetMask: 255.255.255.0

Type: Transit net Cost: 1
DR: 2.2.2.60 Address: 2.2.2.60

Network LSAs
==========
LS ID(DR's IP): 2.2.2.60 ADV rtr: 1.1.1.60 Age: 506 Where: 2
Sequence: 0x80000002 Cost: 0x1 Checksum: 0xb5c3

Summary Network LSAs
==========
ASBR Summary LSAs
==========
AS External LSAs

Showing information	explanation
OSPF router ID	Layer 3 switch ID
Area 1>>>>>>>> Area ID： 0	LSA database information from area 1 to area 0
Router LSAs	routing LSA
Network LSAs	netowrk LSA
Summary Network LSAs	summary network LSA
ASBR Summary LSAs	Autonomous system external LSA

6) show ip ospf interface
use this command to show information about interface OSPF routing protocols
for example: showing information is as follows
Switch#show ip ospf interface vlan 1
IP address： 11.11.4.1 Mask： 255.255.255.0 Area： 0
Net type： BROADCAST cost： 1
State： IBACKUP Type： BDR
Priority： 1 Transit Delay： 1
DR： 11.11.4.2 BDR： 11.11.4.1
Authentication key：
Timer： Hello：10 Poll： 0 Dead： 40 Retrans： 5
Number of Neigbors： 1 Nubmer of Adjacencies： 1
Adjacencies：
1： 11.11.4.2

Showing contents	explanation

IP address	interface IP address
Mask	interface mask
Area	interface area
Net type	network type, such as broadcast, point to point, etc
cost	the value of cost
State	state
Type	the type of layer 3 switch, such as if it is a specified layer 3 switch
Priority	the priority of electing specified layer 3 switch
Transit Delay	the delay value of interface transmitting LAS
DR	specify layer 3 switch
BDR	backup specified layer 3 switch
Authentication key	authentication key of OSPF message
Timer： Hello、Poll、Dead、Retrans	OSPF protocol timer, including hello message, pollinterval message, routing invalid, retransmit routing, etc
Number of Neigbors	the number of neighbor layer 3 switches
Nubmer of Adjacencies	the number of neighbor routing interfaces
Adjacencies	IP address of neighbor interfaces

7) show ip ospf neighbor

use this command to show the information about OSPF neighbor layer 3 switch

For example: showing information is as follows:

```
Switch#show ip ospf neighbor
interface ip 12.1.1.1       area id 0
   router id 12.1.1.2        router ip addr 12.1.1.2
   state NFULL       priority 1
   DR 12.1.1.2        BDR 12.1.1.1
   last hello 66261       last exch 65712
interface ip 30.1.1.1       area id 0
interface ip 50.1.1.1       area id 0
   router id 50.1.1.2        router ip addr 50.1.1.2
   state NFULL       priority 0
   DR 50.1.1.1        BDR 0.0.0.0
   last hello 66286       last exch 49614
interface ip 51.1.1.1       area id 0
interface ip 52.1.1.1       area id 0
interface ip 100.1.1.1       area id 0
interface ip 110.1.1.1       area id 0
interface ip 150.1.1.1       area id 0
   router id 12.2.0.0        router ip addr 150.1.1.2
```

state NFULL priority 0

DR 150.1.1.1 BDR 0.0.0.0

last hello 66289 last exch 49607

Showing information	explanation
interface ip	a port IP address of layer 3 switch
area id	port area number
router id	ID number of neighbor layer 3 switch
router ip addr	port IP address of neighbor layer 3 switch
state	link state
priority	priority
DR	ID of specified layer 3 switch
BDR	ID of backup specified layer 3 switch
last hello	the last hello message
last exch	The last switching message

8) show ip ospf routing

use this command to show information about OSPF routing table

for example: showing information is that:

Switch#show ip ospf routing

AS internal routes：

Destination	Area	Cost	Dest Type	Next Hop	ADV rtr
11.11.1.0	1	1	0	11.11.1.1	14.14.14.1
11.11.4.0	0	1	0	11.11.4.1	11.11.4.2
11.11.2.0	1	2	0	11.11.1.2	11.11.2.1
11.11.3.0	1	11	0	11.11.1.3	14.14.14.1

AS external routes：

Destination	Cost	Dest Type	Next Hop	ADV rtr

Showing information	explanation
AS internal routes	internal prutes of autonomous system
AS external routes	external routes of autonomous system
Destination	destination segment
Area	area number
Cost	cost value
Dest Type	the type of routes
Next Hop	the next hop
ADV rtr	inform interface address of layer 3 switch

9) show ip ospf virtual-links

use this command to show information about OSPF virtual link

for example: showing information is as follows:

Switch#show ip ospf virtual-links

no virtual-link

10) show ip protocols

use this command to show information about currently operating routing protocols in layer 3 switch

For example: showing information is as follows

Switch#sh ip protocols

RIP is shutting down.

OSPF information:
my router ID is 1.1.1.60
preference=110 ase perference=150
export metric=1
export tag=2147483648
LSRefreshTime is 1800
area ID 0
interface count:2
48 times spf has been run for this area
net range:

Showing information	explanation
My router ID	ID number of layer 3 switchi which operate OSPF protocol
Preference	priority of OSPF routing
Ase perference	priority of autonomous system external routing
Export metric	the value of exporting OSPF routing
Export tag	the tag value of exporting OSPF routing
Area ID	ID number of OSPF area of layer 3 switch
Interface count	the number of interfaces which operate OSPF routing protocol
N times spf has been run for this area	layer 3 switch operate minimum STP calculation
Net range	the network range of operating OSPF protocol
LSRefreshTime	The interval of OSPF protocol refreshing LSA

13.4.3.2 OSPF troubleshooting help

On the coonfiguraiton and application of OSPF protocol, OSPF is unable to work normally due to wrong in physical connection or configuration, etc, so user need to pay attention to the following points:

- ✧ first, ensure all physical connections are right
- ✧ second, ensure port and link protocols are UP (use show interface command)
- ✧ third, enable OSPF protocol (use router ospf command), configure OSPF area for corresponding interface
- ✧ next, please pay attention to the feature of OSPF protocol—OSPF backbone area (area 0) must be ensured that it is continous; if virtual links are not continuously used, all other areas are connected with each other through area 0, direct connection is not allowed. Border layer 3 switch menas a part of ports of layer 3 swith are members of area 0, and the other potr of ports belong to non area 0. For brocast network, etc multi access network, specified switch (DR) need to be selected.
- ✧ If OSPF routing problem still exist after above checking steps, we can use debug ip ospf packet/event, etc commands, and copy the DEBUG information in 3 minutes and send it to KYLAND technical service center.

13.5 WEB management

Click Device Advance Configuration→Route Configuration to expand the submenu of routing

protocol configuration which includes following parts:
Static route configuration
RIP configuration
OSPF configuration
Show ip route

13.5.1 Static Route Configuration

13.5.1.1 static route configuration

Click Device Advance Configuration→Route Configuration→Static Route Configuration to enter configuration page.
Explanation:
Destination IP address
Destination network mask
Next Hop—the next hop IP address
Priority (1-255)
If adding a route, input 1.1.1.0 in destination IP, 255.255.255.0 in mask, 2.1.1.1 in dafult gateway, if do not enter priority, it adopts default value, then click "Add"

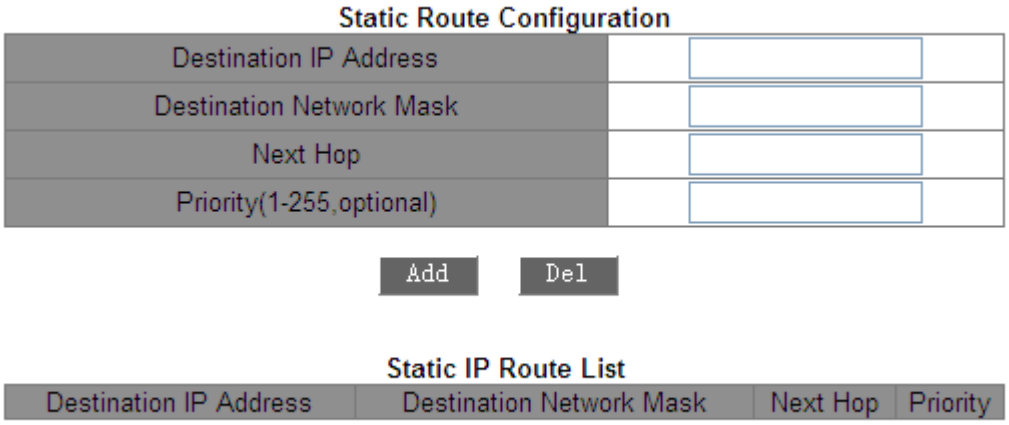


Figure 13-5 static route configuration

13.5.2 RIP

Click Device Advance Configuration→Route Configuration→RIP Configuration to make RIP condiguration which includes following parts
Enable RIP, including
Enable RIP
Enable port to receive/transmit RIP packet
RIP parameter configuration, including
Enable imported route
Metric in/out configuration
RIP port configuration
RIP mode configuration
RIP timer configuration (renewal, timeout, control, etc)

13.5.2.1 Enable RIP

Click Enable RIP to enter configuration page

Explanation:
Enable RIP—include enable RIP and disable RIP

Figure 13-6 enable RIP

13.5.2.2 Enbale port to receive/transmit RIP packet

click Enbale port to receive/transmit RIP packet to enter configuration page
explanation:
Port—port name
Enbale port to receive/transmit RIP packet -set or cancel

If uer want to cancel receiving and transmitting RIP packets in vlan1, select vlan1 in port, and select"cancel", click "Apply"

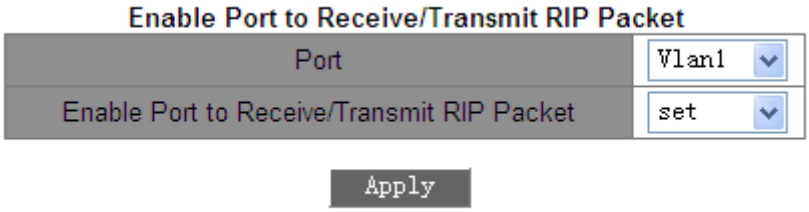


Figure 13-7 configure interface to receive and transmit packets

13.5.2.3 Enable Imported Route

click Enable Imported Route to enter the configuration page
explanation;
Import other routing protocol to RIP-- the protocols include Static, OSPF, BGP
Redistribute imported route cost
operation type--add or remove

if user want to bring OSPF protocol route with value of 5 to RIP message, select OSPF in protocol, enter 5 in the value, click "Apply"

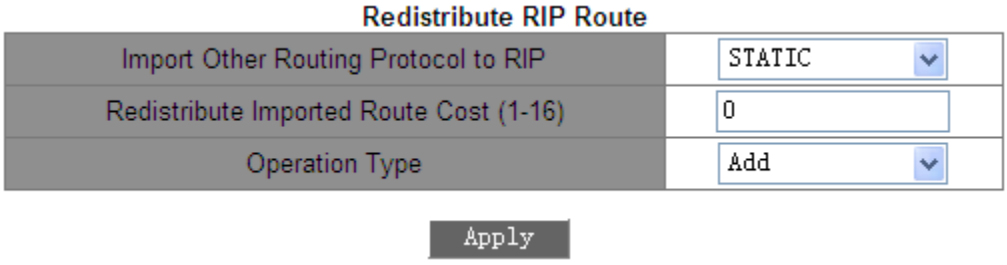


Figure 13-8 RIP route configuration

13.5.2.4 Metric in/out route

click Metric in/out route to enter the configuration page

explanation:
In--added routing value of receiving RIP message
Out--added routing value of sending RIP message, which is equivalent to CLI command in chapter 13.3.2.2.6
Port-port name

To configure added routing value, enter configuration values in In and Out, selext a port, click "Apply"

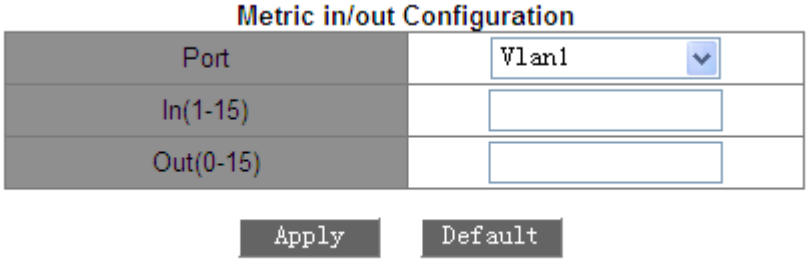


Figure 13-9 interface added routing value configuration

13.5.2.5 RIP port configuration

Click RIP port configuration to enter the configuration page
Explanation:
Port- - port name
Receiving RIP version-set the version of port received RIP message, inclucing version1, version2 and version 1&2
Sending RIP version--set the version of port transmitted RIP message, including version1, version2 (BC) and version2 (MC)
Receive packet--set if the port can receive RIP message, including yes and no
Send Packet- set if the port can transmit RIP message, inclucing yes and no
Split-horizon status--set if horizontal split is allowed, incluing permit and forbit
RIP authentication key--set the key used in RIP authentication
RIP authentication type--set the type of authentication, text means test authentication, md5 means general MD5 authentication, Cisco MD5 means Cisco MD5 authentication, cancel means restore default configuration
Select or input needed configuration values, calick "Apply" to finish configuration

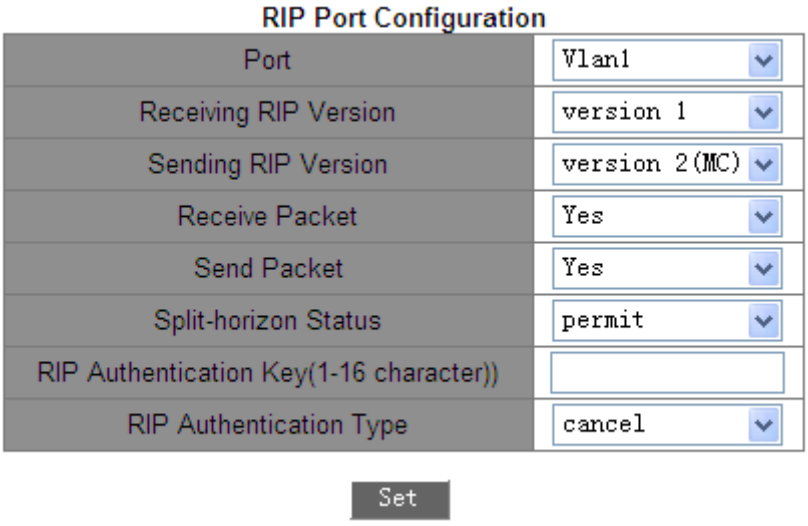


Figure 13-10 RIP interface configuration

13.5.2.6 RIP mode configuration

Click RIP mode configuration to enter configuration page

Explanation:

Set receiving/sending RIP version for all ports--set the version of RIP datagram transmitted/received by router ports, including version1, version2 and cancel (default value)

Auto-summary-- configure routing aggregation function inclucing set and cancel

RIP priority (0-255)-- set the priority of RIP protocol routes

Set default route cost for imported route

RIP checkzero-- set to check zero field of RIP message, including set and cancel

RIB Broadcast- -set all ports of layer 3 switch to transmit RIP broadcast packets or multicast packets, including set and cancel

Select and enter needed configuration values, click “Apply”

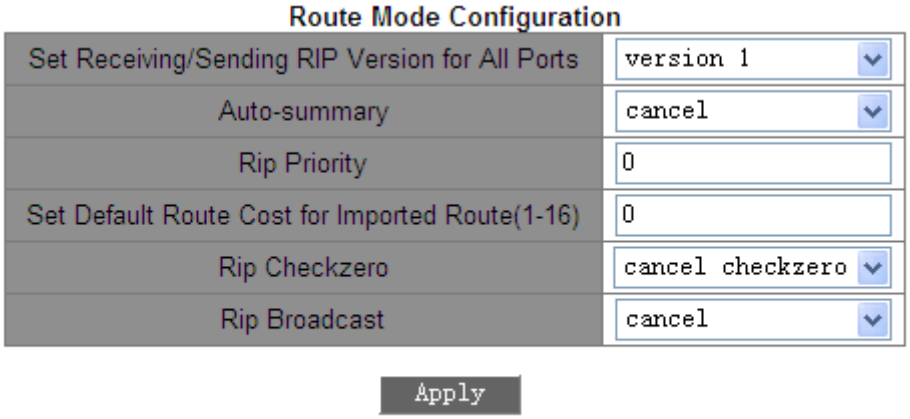


Figure 13-11 RIP mode configuration

13.5.2.7 RIP timer configuration

click RIP timer configuration to enter configuration page

explanation:

Update timer- the interval of send updated message

Invalid timer- the interval of declaring RIP routing invalidity
Holddown timer-the interval of routing existing in routing table after invalidity
Enter needed configuration values, click "Apply"

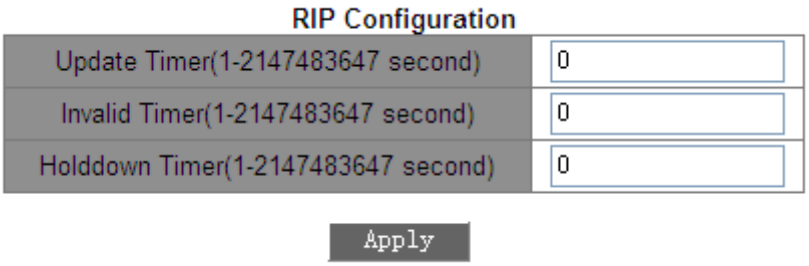


Figure 13-12 RIP timer configuration

13.5.3 OSPF

Click Device Advanced Configuration→Route Configuration→OSPF Configuration to open OSPF configuration menu, which include the following parts:
OSPF Enable
OSPF TX parameter configuration
Imported Route Parameter Configuration
Other parameter configuration
OSPF Debug

13.5.3.1 OSPF Enable

Click OSPF Enable to expand configuration menu which include the following ports:
OSPF Enable/Disable
Router-ID configuration
OSPF network range configuration
OSPF ares configuration for port (must)

13.5.3.1.1 OSPF Enable/Disable

Click OSPF enable/disable to enter the configuration page
Explanation:
OSPF status-open/close

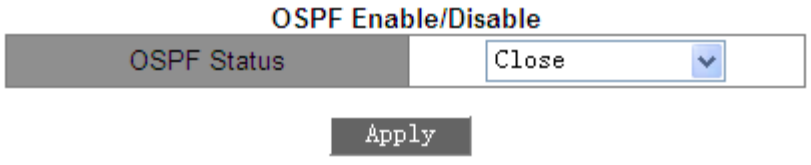


Figure 13-13 enable/disable OSPF protocol

13.5.3.1.2 Router-ID configuration

Click Router ID configuration to enter the configuration page
Explanation:
Router ID configuration- ID number
Default--IP of VLAN1

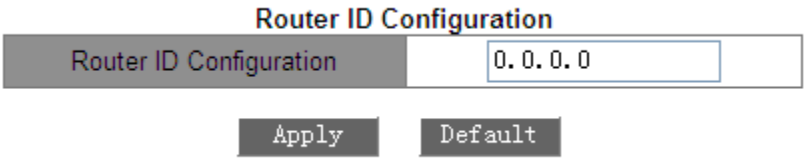


Figure 13-14 Router ID configuration

13.5.3.1.3 OSPF network range configuration

Click OSPF network range configuration to enter configuration page

Explanation:

Network-network IP address

Network mask

Area ID

Advertise--specify if broadcast the brief information of routes in this network range, including yes and no

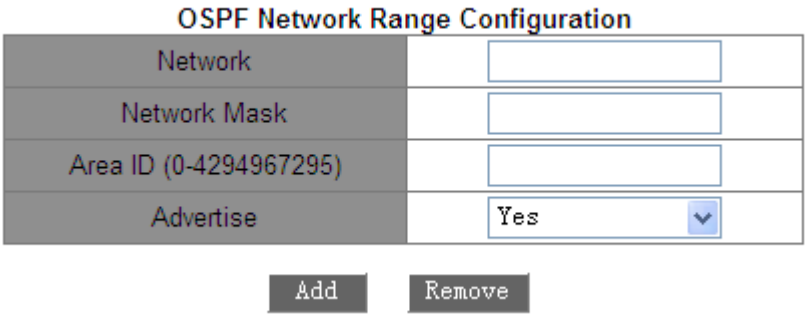


Figure 13-15 OSPF network range configuration

13.5.3.1.4 OSPF Area Configuration for Port

Click OSPF area configuration for port to enter the configuration page

Explanation:

Vlan port-- port list

Area ID

If user wants to configure vlan1 to be the member of area1, select vlan1 in port, enter 1 in area number, click "Add"

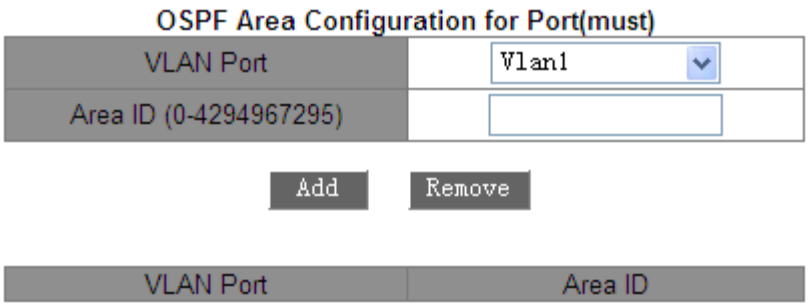


Figure 13-16 configure interface area

13.5.3.2 OSPF TX-parameter configuration

Click OSPF TX-parameter configuration to expand configuration menu which includes following parts:
OSPF authentication parameter configuration
Passive interface configuration
OSPF packet sending timer configuration

13.5.3.2.1 OSPF authentication parameter configuration

Click OSPF authentication parameter configuration to enter configuration page
Explanation:
Vlan port
Authentication mode- Specify authentication mode of interface receiving OSPF message, including simple and MD5
Simple authentication key--authentication key
MD5 authentication key-- authentication key
MD5 authentication key--authentication kay
MD5 KeyID-- authentication words of MD5 authentication mode
Only one type of authentication mode can be configured.

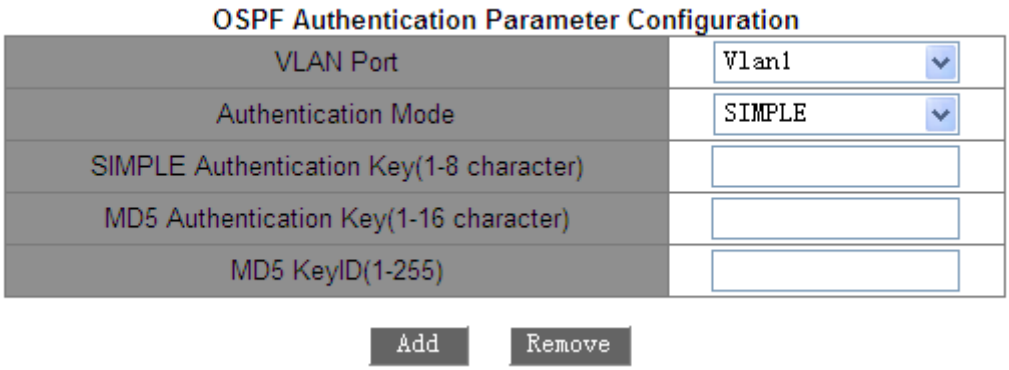


Figure 13-17 configure OSPF authentication parameter

13.5.3.2.2 Passive interface configuration

Click Passive interface configuration to enter the configuration page
Explanation:
VLAN Port
If user needs to configure vlan1 to receive OSPF message, select vlan1 and click “configuration”

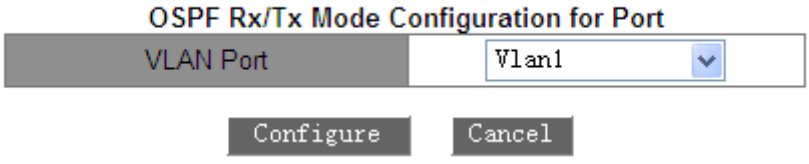


Figure 13-18 Passive interface configuration

13.5.3.2.3 OSPF packet sending timer configuration

Click OSPF packet sending timer configuration to enter the configuration page
Explanation:
Vlan port
OSPF route cost configuration-- specify the cost of interface operating OSPF protocol

Hello Packet interval-- specify the interval of interface sending HELLO message
Neighbor router invalid interval -- specify the time period of neighbor layer 3 switch invalidity
Sending Link –state packet delay- -set the delay of interface sending LSA
Sending Link –state packet retransmit interval--specify the retransmit interval of sending LSA between interface and its neighbor layer 3 switch

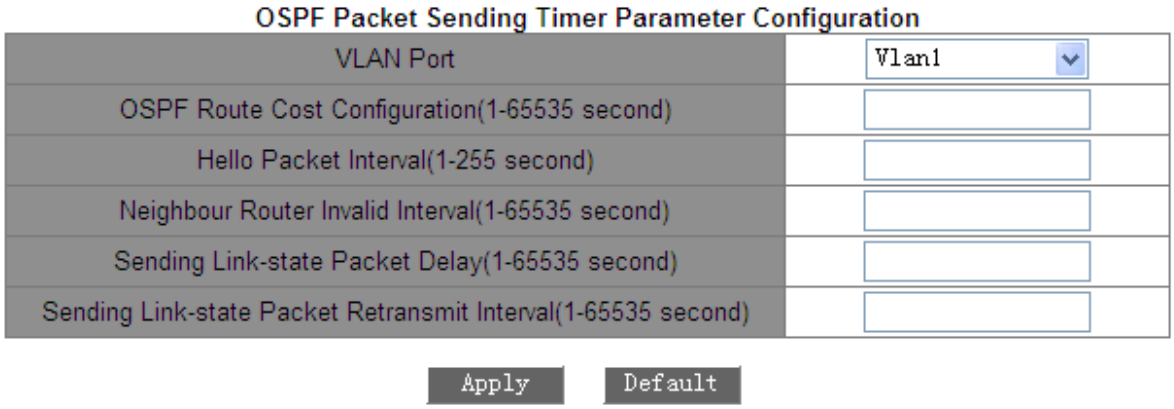


Figure 13-19 OSPF packet sending timer configuration

13.5.3.3 Importer route parameter configuration

Click Importer route parameter configuration to expand configuration menu which include following parts
Imported Route Parameter Configuration
Import External Routing Information

13.5.3.3.1 Imported Route Parameter Configuration

Click Imported Route Parameter Configuration to enter configuration page
Imported route parameter configuration-default type of imported routes; 1 indicates Type 1 external routes, and 2 indicates Type 2 external routes.
Default imported route tag- the default tag of imported routes
Default imported route cost- default cost of imported routes
Imported route interval- the interval for importing external routes
Maximum imported route- the maximum number of routes that can be imported by OSPF at one time.

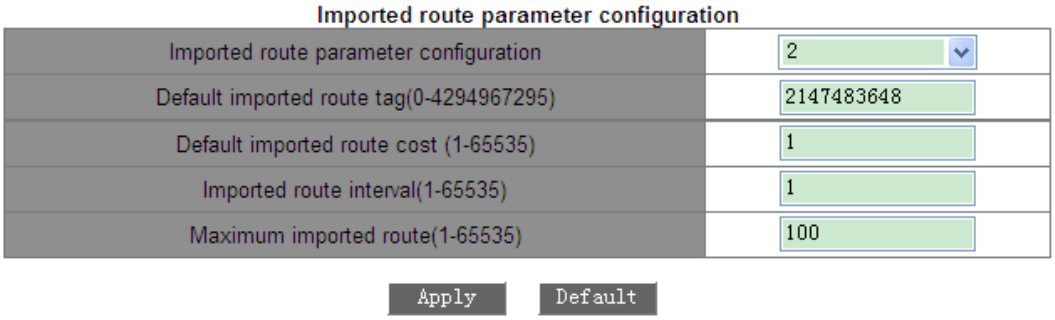


Figure 13-20 Importer route parameter configuration

13.5.3.3.2 Import External Routing Information

Click Import External Routing Information to enter configuration page

Explanation:
Imported type--including Static, RIP, connected, BGP working as external routing information
Type--specify the type of external routing, 1,2 means external routing type 1 and type2
Tag
Metric value-- specify routing value

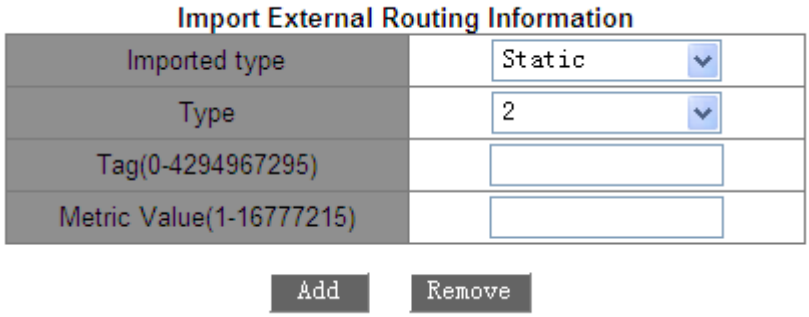


Figure 13-21 Import External Routing Informationton

13.5.3.4 Other parameter configuration

Click Other parameter configuration to expand configuration menu which includes the following parts
OSPF priority configuration
OSPF STUB Area and default route cost
OSPF virtual link configuration
Port DR priority configuration

13.5.3.4.1 OSPF priority configuration

Click OSPF priority configuration to enter configuration page
Explanation:
Priority-- speicify the priority of specified OSPF protocol in various routing protocols
ASE-- means the priority of specified autonomous system external routing

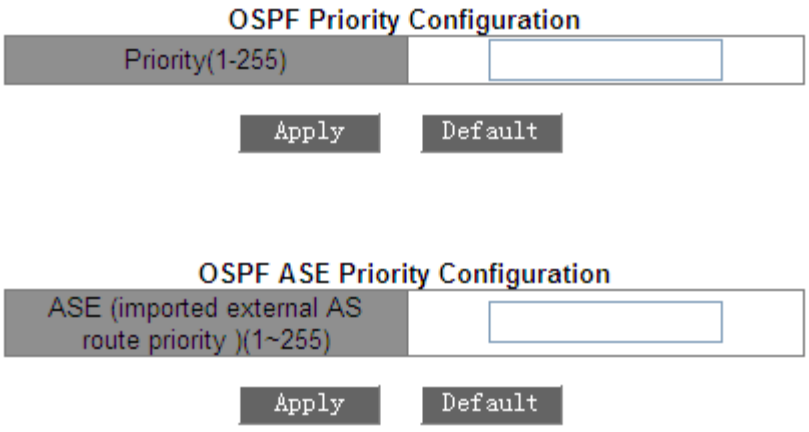


Figure 13-22 OSPF priority configuration

13.5.3.4.2 OSPF STUB Area and default route cost

Click OSPF STUB Area and default route cost to enter the configuration page
Explanation:

Default route cost--the cost value of stub area default routing
Area ID --stub area number

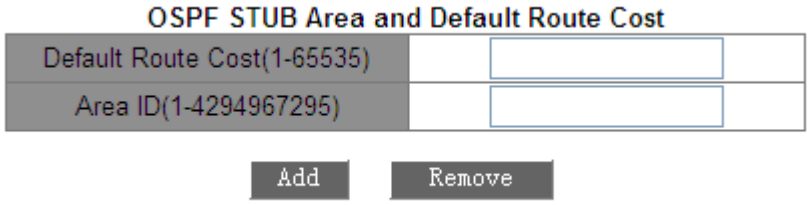


Figure 13-23 OSPF STUB Area and default route cost

13.5.3.4.3 OSPF virtual link configuration

Click OSPF virtual link configuration to enter the configuration page
Explanation:
Route ID (A, B, C, D)--ID of virtual connected neighbor
Tranmit area ID (1-4294967295)-- tranmit area number
Hello packet interval (1-255s)
Neighbor router invalid interval (1-65535s)- the time period of routing invalidity
Sending Link-state packet delay (1-65535s)
Sending Link-state packet retransmit interval (1-65535s)

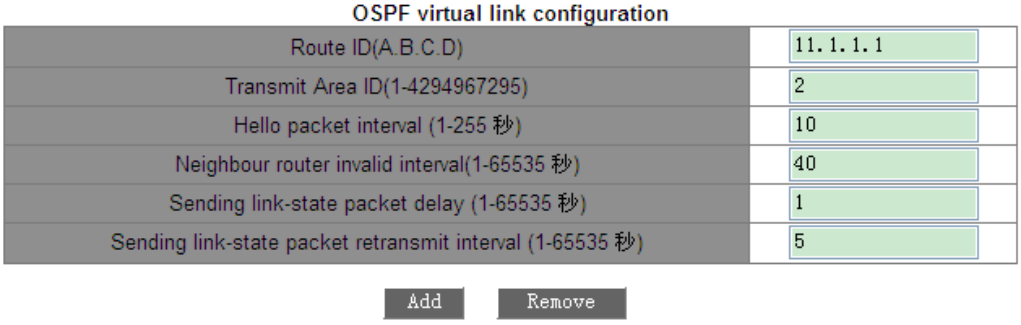


Figure 13-24 Configure OSPF virtual link

13.5.3.4.4 Port DR priority configuration

Click Port DR priority configuration to enter the configuration page
Explanation:
Vlan port- port
Priority

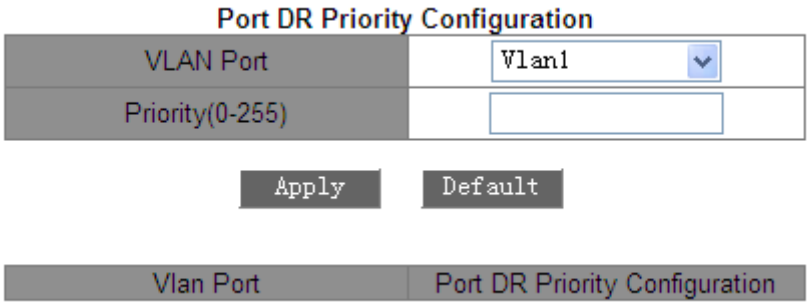


Figure 13-25 Port DR priority configuration

13.5.3.5 OSPF Debug

Click OSPF debug to expand configuration menu which includes following parts:

Show IP OSPF

Show IP OSPF ASE

Show IP OSPF cumulative

Show IP OSPF connection database

Show IP OSPF neighbor

Show IP OSPF routing

Click corresponding button to view information:

13.5.4 show IP route

Click show IP route

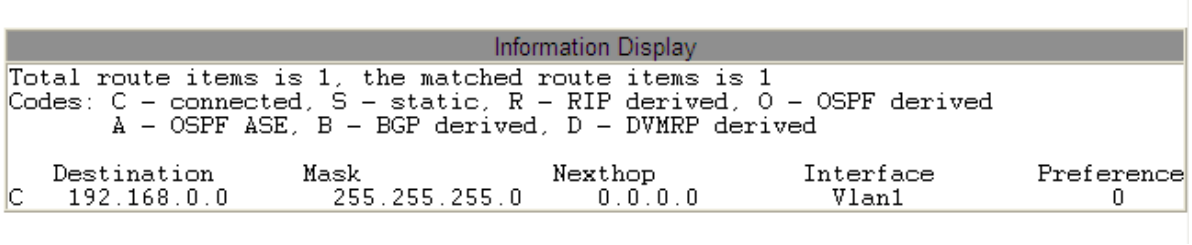


Figure 13-26 show IP route

Chapter 14 Multicast protocol configuration

14.1 Multicast protocol

14.2 common mulitcast configuration

14.2.1 multicast configuration command

Command: show ip mroute

14.2.1.1 show ip mroute

Command: **show ip mroute [*group_address*] [*source_address*]**

Function: show ip multicast message forwarding items

Parameter: **[*group_address*]** is to show group address of forwarding items; **[*source_address*]** is to show source address of forwarding items

Default: no t to show

User guide: use this command to show ip multicast forwarding items which are to forward multicast message in in system FIB table

Example: show all ip multcast forwarding items

Switch # show ip mroute

Name: Loopback, Index: 27, State:9 localaddr: 127.0.0.1, remote: 127.0.0.1

Name: Vlan1, Index: 29, State:13 localaddr: 1.1.1.1, remote: 1.1.1.1

Name: Vlan4, Index: 52, State:13 localaddr: 2.1.1.1, remote: 2.1.1.1

Name: Vlan3, Index: 40, State:13 localaddr: 3.1.1.1, remote: 3.1.1.1

Group	Origin	Iif	Wrong	Oif:TTL
225.1.1.101	1.1.1.100	Vlan1	0	52:1
				40:1
239.255.0.1	9.1.1.100	Vlan4	0	29:1
239.255.0.1	7.1.1.100	Vlan4	0	29:1
239.255.0.1	1.1.1.100	Vlan1	0	52:1
				40:1

Switch #

Showing information	explanation
Name	interface list which is used by multicast protocols and describe basic information of port
Index	port index number
Group	group address of multicast forwarding items
Origin	source address of multcast forwarding items
Iif	ingress interface of multicast forwarding item
Wrong	count multicast message which is receivd from wrong ingress interface
Oif:TTL	Oif egress interface list, use interface index number to correspond with above ingress interface list and interface index number; TTL is the threshold of TTL in this egress interface

14.3 PIM-DM

14.3.1 PIM-DM configuration

14.3.1.1 Task sequence of PIM-DM configuration

1. enable PIM-DM (mandatory)

2. configure PIM-DM assistant parameter (optional)

1) configure PIM-DM interface parameter

2) configure the interval of PIM-DM hello message

3. disable PIM-DM protocol

1. enable PIM-DM protocol

It is simple to operate PIM-DM in KYLAND layer 3 switch, just turning on PIM-DM switch.

Command	explanation
interface configuration mode	
[no] ip pim dense-mode	enable PIM-DM protocol; no command is to disable PIM-DM protocol (mandatory)

2. configure PIM-DM assistant parameter

1) configure PIM-DM interface parameter

2) configure interval of PIM-DM hello message

Command	explanation
interface configuration mode	
ip pim query-interval <*query interval*> **no ip pim query-interval**	Configure interval of PIM-DM hello message; no command is to restore default value

3. disable PIM-DM protocol

Command	explanation
interface configuration mode	
no ip pim dense-mode	Disable PIM-DM protocol

14.3.1.2 PIM-DM configuration commands

- **ip pim dense-mode**
- **ip pim query-interval**
- **show ip pim interface**
- **show ip pim mroute dm**
- **show ip pim neighbor**
- **debug ip pim**

14.3.1.3 ip pim dense-mode

Command: **ip pim dense-mode**

no ip pim dense-mode

Function: enable PIM-DM protocol in interface; no command is to disable PIM-DM protocol

Parameter: none

Default: disable PIM-DM protocol

Command mode: interface configuration mode

User guide: none

Example: enable PIM-DM protocol in vlan1

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip pim dense-mode

14.3.1.4 ip pim query-interval

Command: **ip pim query-interval <*query interval*>**

no ip pim query-interval

Function: configure the interval of interface PIM-DM hello message; no command is to restore deault value

Parameter: ***<query interval>*** is the interval of regularly sending PIM-DM hello message in a range of 1~18724s

Default: the default interval of regularly sending PIM-DM hello message is 10s

Command mode: interface configuration mode

User guide: hello message make PIM-DM switches are able to fix location from each other to ensure neighborhood realtion. PIM-DM switch inform its existence by regularly sending hello message to its neighbors. If the switch dose not receive hello messge from its neighbors within the fixed time, it think that its neighbor is lost. This interval value shoudn't be longer than the timeout of its neighbor.

Example: configure interval of PIM-Dm hello in vlan1

Switch (Config)#interface vlan1

Switch(Config-If-Vlan1)#ip pim query-interval 20

14.3.2 PIM-DM typical example

As figure below, add the ethernet ports of SiwtchA and SwitchB to corresponding vlan and enable PIM-DM protocol in vlan ports

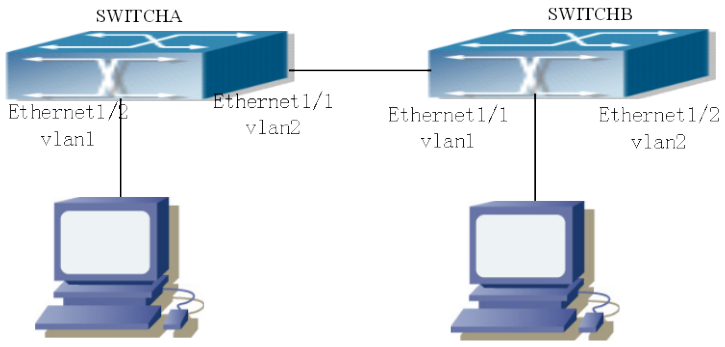


Figure 14-1 PIM-DM typical environment

The configuration steps of SWITCHA and SWITCHB are as follows:

(1) SWITCHA configuration

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)# ip pim dense-mode

Switch(Config-If-Vlan1)#exit

Switch (Config)#interface vlan2

Switch(Config-If-Vlan1)# ip pim dense-mode

(2) SWITCHB configuration

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)# ip pim dense-mode

Switch(Config-If-Vlan1)#exit

Switch (Config)#interface vlan 2

Switch(Config-If-Vlan1)# ip pim dense-mode

14.3.3 PIM-DM troubleshooting help

1. monitoring and debugging commands

2. PIM-DM troubleshooting help

14.3.3.1 monitoring and debugging commands

Command	explanation

Authorized uer configuration mode	
show ip pim mroute dm	show PIM-DM message forwarding items
show ip pim neighbor	show PIM-DM neighbor information
show ip pim interface	show PIM-DM interface information
debug ip pim	enable the debugging switch of showing pim detail information

14.3.3.2 show ip pim mroute dm

Command: **show ip pim mroute dm**

Function: show PIM-DM message forwarding items

Parameter: none

Default: not to show

Command mode: privilege user configuration mode

User guide: use this command to show PIM-DM multicast forwarding items which are used to forward multicast message in FIB table

Example: show all PIM-DM message forwarding items

```
Switch#sh ip pim mroute dm

BIT Proto: DVMRP 0x2, PIM 0x8, PIMSM 0x10, PIMDM 0x20;
        Flags: RPT 0x1, WC 0x2, SPT 0x4, NEG CACHE 0x8, JOIN SUPP 0x10;
        Downstream: IGMP 0x1, NBR 0x2, WC 0x4, RP 0x8, STATIC 0x10;

PIMDM Group Table, inodes 7 routes 4:

(5.1.1.100, 225.0.0.1), protos: 0x8, flags: 0x4, 00:22:21/00:03:30
  Incoming interface : Vlan3, RPF Nbr 0.0.0.0, pref 0, metric 0
  Outgoing interface list:
        (Vlan1), protos: 0x2, UpTime: 00:22:21, Exp:/
  Prune interface list:
        (Vlan2), protos: 0x2, UpTime: 00:22:21, Exp: 00:03:07

(5.1.1.100, 225.0.0.2), protos: 0x8, flags: 0x4, 00:18:52/00:03:30
  Incoming interface : Vlan3, RPF Nbr 0.0.0.0, pref 0, metric 0
  Outgoing interface list:
        (Vlan1), protos: 0x2, UpTime: 00:18:52, Exp:/
  Prune interface list:
        (Vlan2), protos: 0x2, UpTime: 00:18:52, Exp: 00:02:51
Switch#
```

Showing information	explanation
(5.1.1.100, 225.0.0.1)	forwarding item
Incoming interface	ingress interface (RPF interface)
Outgoing interface list	egress interface list
Prune interface list	Downstream prune interface list

14.3.3.3 show ip pim neighbor

Command: **show ip pim neighbor [<*ifname*>]**

Function: show nerighbor information of pim interface

Parameter: ***<ifname>*** is the name of interface which is to show pim neighbor information in specified interface

Default: show all pim neighbor information in all ports

Command mode: auithorized user configuration mode

User guide: if no entering interface name, show pim neighbor information in all ports

Example: show pim neighbor information in all interfaces (not entering interface name)

```
Switch#sh ip pim neighbor
Neighbor-Address Interface          ifIndex Uptime    Expires  DR-state
 2.1.1.1         Vlan1              2005    00:25:17 00:01:15 /
 9.1.1.6         Vlan2              2006    00:25:09 00:01:35 DR
 5.1.1.4         Vlan3              2007    00:25:01 00:01:38 DR
Switch#
```

Showing information	explanation
Neighbor-Address	Neighbor address
Interface	Interface which find out this neighbor
ifIndex	interface index number
Uptime	The time of his beighbor has existed
Expires	the time left until the timeout of this neighbor
DR-state	if this neighbor is a DR

14.3.3.4 show ip pim interface

Command: **show ip pim interface [<*ifname*>]**

Function: show pim interface information

Parameter: ***<ifname>*** is the name of interface which is to show pim information in specified interface

Default: show pim information of all ports

Command mode: privilege user configuration mode

Example: show pim information in vlan1

```
Switch#sh ip pim interface vlan 1
Interface Vlan1 : 2.1.1.2
  owner is pimdm, Vif is 1, Hello Interval is 30
  Neighbor-Address Interface          Uptime    Expires
  2.1.1.1          Vlan1              00:26:23 00:01:39
Switch#
```

Showing information	explantion
Interface (up)	ip interface name and interface ip
Owner	multicast routing protocol which interface belong to
Vif	the index of virtual interface which corresponds to interface
Hello Interval	hello message interval of interface (unit: second)
Neighbor-Address	neighbor address

Interface（down）	interface which discover this neighbor
Uptime	The time of his beighbor has existed
Expires	the time left until the timeout of this neighbor

14.3.3.5 debug ip pim

Command: **debug ip pim**

Function: enable the debugging switch to show pim detail information; no command is to disable debugging switch

Parameter: none

Default: disable

Command mode: privilege user configuration mode

User guide: if uer nee to check the detail information of pim message, etc, please enable this debugging switch

Example:

Switch # debug ip pim

00:15:45: PIM: Send v2 Hello on vlan1, holdtime 105

00:15:45: PIM: Send v2 Hello on vlan1, holdtime 105

00:15:45: PIM: Received v2 Hello on vlan1 from 2.1.1.2, holdtime 105

14.3.3.6 PIM-DM troubleshooting help

On configuration and application PIM-DM protocol, PIM-DM might not be able to wotk normally due to faulty physical connetion, error configuration, etc, so pelase pay attention to following points:

- ✧ First, ensure all physical connection are correct
- ✧ Secondly, ensure ports and link protocols are UP (use show interface command)
- ✧ Then, enable PIM-DM protocol in port (use ip pim dense-mode command)
- ✧ Multicast protocol need to use unicast ruting to operate RPF checking , so please ensure the correctness of unicast routing

If PIM-DM problem still exist after above checking steps, we can use debug ip pim command, and copy the DEBUG information in 3 minutes and send it to KYLAND technical service center.

14.4 PIM-SM

14.4.1 PIM-SM configuration

14.4.1.1 task sequence of PIM-SM configuration

1. enable PIM-SM (mandatory)
2. configure PIM-SM assistant parameter (optional)
    1) configure PIM-SM interface parameter
        a) configure the interval of PIM-SM hello message
        b) configure interface to be PIM-SM domain border
        c)configure priority of interface DR election
    2) configure PIM-DM global parameter
        a) configure switch to be candidate BSR
        b) configure switch to be candidate RP
3. disable PIM-SM protocol

1. enable PIM-SM protocol

It is simple to operate PIM-SM routing protocol in KYLAND series layer 3 switch, just turning on

PIM-Sm switch

Command	explanation
Interface configuration mode	
[no] ip pim sparse-mode	enable PIM-SM protocol; no command is to disable PIM-SM protocol (mandatory)

2. configure PIM-SM assistant parameter

1) configure PIM-SM interface parameter

a) configure the interval of PIM-SM hello message

Command	explanation
Interface configuration mode	
ip pim query-interval <*query interval*> **no ip pim query-interval**	Configure the interval of interface PIM-SM hello message; no command is to restore default values

b) configure interface to be PIM-SM BSR border

Command	explanation
Interface configuration mode	
ip pim bsr-border **no ip pim bsr-border**	Configure interface to be PIM-SM BSR border; no command is to cancel the setting of BSR border

c) configure priority of interface DR election

Command	explanation
Interface configuration mode	
ip pim dr-priority <dr-pri-val> **no ip pim dr-priority**	Configure priority of interface attending DR election; no command is to restore default value

2) configure PIM-SM global parameter

a) configure switch to be a candidate BSR

Command	explanation
Interface configuration mod e	
ip pim bsr-candidate <*ifname*> **[*hashlength*] [*Priority*]** **no ip pim bsr-candidate**	This command is for global candidate BSR configuration; used to configure the information of PIM-SM candidate BSR to compete for BSR router with other candidates; no command is to cancel candidate BSR configuration

b) configure switch to be candidate RP

Command	explanation
Interface configuration mode	

ip pim rp-candidate <*ifname*> [group-list *access-list*] [interval *interval*] **no ip pim rp-candidate [<*ifname*>]**	This command is for global candidate RP configuration; used to configure the information of PIM-SM candidate RP to compete for RP router with other candidates; no command is to cancel candidate RP configuration

3. disable PIM-SM protocol

Command	explanation
Interface configuration mod e	
no ip pim sparse-mode	Disable PIM-SM protocol

14.4.1.2 PIM-SM configuration commands

- **ip pim sparse-mode**
- **ip pim bsr-border**
- **ip pim query-interval**
- **ip pim dr-priority**
- **ip pim bsr-candidate**
- **ip pim rp-candidate**
- **show ip pim bsr-router**
- **show ip pim interface**
- **show ip pim mroute sm**
- **show ip pim neighbor**
- **show ip pim rp**
- **debug ip pim**
- **debug ip pim bsr**

14.4.1.2.1 ip pim sparse-mode

Command: **ip pim sparse-mode**
no ip pim sparse-mode
Function: enable PIM-SM protocol in interface; no command is to disable PIM-SM protocol
Parameter: none
Default: disable PIM-SM protocol
Command mode: interface configuration mode
User guide:
Example: enable PIM-SM protocol in vlan1
Switch (Config)#interface vlan 1
Switch(Config-If-Vlan1)#ip pim sparse-mode

14.4.1.2.2 ip pim bsr-border

Command: **ip pim bsr-border**
no ip pim bsr-border
Function: this command is a interface BSR border configuration command; used to configure the border of PIM-SM area in order to prevent the diffusion of BSR information to other areas; no command is to cancel BSR border configuration
Parameter: none
Default: disable BSR border configuration

Command mode: interface configuration mode
User guide: this command is for interface BSR border configuration, used to configure the border of PIM-SM area to prevent the diffusion of BSR information to other areas, that means in PIM-SM area, BSR information won't be transmitted to outside from the interface. If cancel BSR border setting, it means cancel this command
Example: enable BSR border configuration in Vlan1
Switch (Config)#interface vlan 1
Switch(Config-If-Vlan1)#ip pim bsr-border

14.4.1.2.3 ip pim query-interval

Command: **ip pim query-interval <*query interval*>**
no ip pim query-interval
Function: configure the interval of pim hello message; no command is to restore default value
Parameter: **<*query interval*>** is the interval of regularly sending pim hello message in a range of 1~18724s
Default: the default interval of regularly sending pim hello message is 30s
Command mode: interface configuration mode
User guide: hello message make pim switches are able to fix location from each other to ensure neighborhood realtion. Pim switch inform its existence by regularly sending hello message to its neighbors. If the switch dose not receive hello messge from its neighbors within the fixed time, it think that its neighbor is lost. This interval value shoudn't be longer than the timeout of its neighbor.
Example: configure interval of PIM-SM hello in vlan1
Switch (Config)#interface vlan 1
Switch(Config-If-Vlan1)#ip pim query-interval 20

14.4.1.2.4 ip pim dr-priority

Command: **ip pim dr-priority <*dr-pri-val*>**
no ip pim dr-priority
Function: configure interface priority in DR election; no command is to resore default value
Parameter: **<*dr-pri-val*>** is the interface priority in DR election in a range of 0～4294967294
Default: the default priority of interface attending DR election is 1
Command mode: interface confifuration mode
User guide: when router receives Hello message, it judge interface DR. the interface with highest DR priority and biggest IP address will be selected to be DR. the default DR priority of interface is 1
Example: configure the interval of PIM-SM hello in vlan1
Switch (Config)#interface vlan 1
Switch(Config-If-Vlan1)#ip pim dr-priority 20

14.4.1.2.5 ip pim bsr-candidate

Command: **ip pim bsr-candidate <*ifname*> [*hash-mask-length*] [*priority*]**
no ip pim bsr-candidate
Function: this command is for global BSR candidate configuration, used to configure the information of PIM-SM BSR candidate to compete for BSR router with other candidates; no command is to cancel BSR candidate configuration
Parameter; ***ifname*** is the name of designated interface; **[*hash-mask-length*]** is to specify the length of mask in hash algorithm, used in the bootload of BR in a range of 0~32; **[*priority*]** is the priority of

this BSR candidate in a range of 0-255. If this parameter is not set, the default priority of this BSR candidate is 0

Default: this switch is not a BSR candidate router

Command moed: global configuration mode

User guide: this command is for global BSR candidate configuration, used to configure the information of PIM-SM BSR candidate to compete for BSR router with other candidates; only configure this command, this switch will be a BSR candidate router.

Example: configure vlan1 to be a interface to transmit BSR candidate information

Switch (Config)# ip pim bsr-candidate vlan1 30 10

14.4.1.2.6 ip pim rp-candidate

Command: **ip pim rp-candidate <*ifname*> [group-list *access-list*] [interval *interval*]**

no ip pim rp-candidate [<*ifname*>]

Function: this command is for global RP candidate configuration, used to configure the information of PIM-SM RP candidate to compete for RP router with other candidates; no command is to cancel RP candidate configuration

Parameter: ***<ifname>*** is the name of designated interface; ***access-list*** show the switches which can work as RP in a range of 1-99; if do not configure this parameter, all multicast groups can serve as RP. ***interval*** is the interval of this RP candidate sending RP candidate message in a range of 1~16383s..

Default: this switch is not RP candidate router

User guide: this command is for global RP candidate configuration, used to configure the information of PIM-SM RP candidate to compete for RP router with other candidates; only configure this command, this switch will be RP candidate router

Example: configure vlan1 to be a interface sending RP candidate public information

Switch (Config)# ip pim rp-candidate vlan1 group-list 5

Switch (Config)# access-list 5 permit 239.255.2.0 0.0.0.255

14.4.2 PIM-SM typical example

As below figure, add switchA, switch, switch, switchD to corresponding vlan, and enable PIM-SM protocol in vlan ports

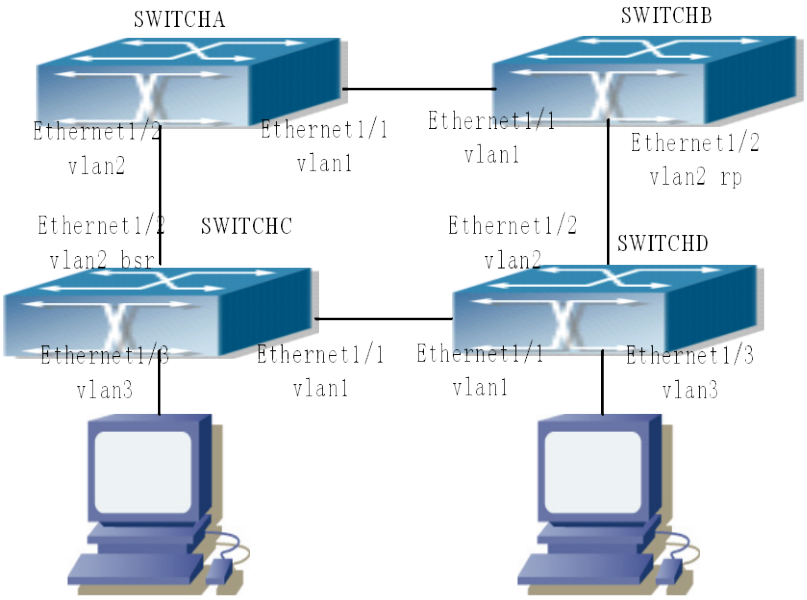


Figure 14-2 PIM-SM typical environment

The configuration steps of SwitchA, SwitchB, SwitchC and SwitchD

(1) SWITCHA configuration

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)# ip pim sparse-mode

Switch(Config-If-Vlan1)#exit

Switch (Config)#interface vlan 2

Switch(Config-If-Vlan2)# ip pim sparse-mode

(2) SWITCHB configuraiton

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)# ip pim sparse-mode

Switch(Config-If-Vlan1)#exit

Switch (Config)#interface vlan 2

Switch(Config-If-Vlan2)# ip pim sparse-mode

Switch(Config-If-Vlan2)# exit

Switch (Config)# ip pim rp-candidate vlan2 group-list 5

Switch (Config)# access-list 5 permit 239.255.2.0 0.0.0.255

(3) SWITCHC configuration

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)# ip pim sparse-mode

Switch(Config-If-Vlan1)#exit

Switch (Config)#interface vlan 2

Switch(Config-If-Vlan2)# ip pim sparse-mode

Switch(Config-If-Vlan2)#exit

Switch (Config)#interface vlan 3

Switch(Config-If-Vlan3)# ip pim sparse-mode
Switch(Config-If-Vlan3)# exit
Switch (Config)# ip pim bsr-candidate vlan2 30 10
(4) SWITCHD configuration
Switch (Config)#interface vlan 1
Switch(Config-If-Vlan1)# ip pim sparse-mode
Switch(Config-If-Vlan1)#exit
Switch (Config)#interface vlan 2
Switch(Config-If-Vlan2)# ip pim sparse-mode
Switch(Config-If-Vlan2)#exit
Switch (Config)#interface vlan 3
Switch(Config-If-Vlan3)# ip pim sparse-mode

14.4.3 PIM-SM troubleshooting help

14.4.3.1 monitoring and debugging commands

14.4.3.1.1 show ip pim bsr-router

Command: **show ip pim bsr-router**
Funtion: show information of pim bsr-router
Parameter: none
Default: not to show
Command mode: privilege user configuration mode
Example: show information of pim bsr-router
Switch #show ip pim bsr-router
Switch #
PIMv2 Bootstrap information
BSR address: 192.4.1.3
Priority: 192, Hash mask length: 30
Expires : 00:02:13.
Switch #

Showing information	explanation
BSR address	Bsr-router address
Priority	Bsr-router priority
Hash mask length	Bsr-router hash mask length
Expires	the time left to the timeout of Bsr-router

14.4.3.1.2 show ip pim interface

Command: **show ip pim interface [<*ifname*>]**
Function: show pim interface information
Parameter: ***<ifname>*** is the name of interface, showing pim information of designated interface
Default: not to show
Command mode: privilege user configuration mode
Example: show pim information of Vlan2
Switch #show ip pim interface vlan2
Switch #
Interface Vlan2 : 192.3.1.2

owner is pimsm, Vif is 1, Hello Interval is 30, pim sm jp interval is (60)
Neighbor-Address Interface Uptime Expires
192.3.1.3 Vlan2 00:12:18 00:01:38
Switch #

Showing information	explanation
Interface (up)	interface name and interface IP
owner	multicast routing protocol which interface belongs to
Vif	the index of virtual interface which corresponds to interface
Hello Interval	hello message interval of interface (unit: second)
jp interval	the interval of adding or prune
Neighbor-Address	neighbor address
Interface (down)	interface which discover this neighbor
Uptime	The time of his beighbor has existed
Expires	the time left until the timeout of this neighbor

14.4.3.1.3 show ip pim mroute sm

Command: **show ip pim mroute sm**
Function: show PIM-SM message forwarding items
Parameter: none
Default: not to show
Command mode: privilege user configuration mode
User guide: use this command to show PIM-SM multicast forwarding items which are used to forward multicast message
Example:
Switch # show ip pim mroute sm
BIT Proto: DVMRP 0x2, PIM 0x8, PIMSM 0x10, PIMDM 0x20;
Flags: RPT 0x1, WC 0x2, SPT 0x4, NEG CACHE 0x8, JOIN SUPP 0x10;
Downstream: IGMP 0x1, NBR 0x2, WC 0x4, RP 0x8, STATIC 0x10;
PIMSM Group Table, inodes 1 routes 1:
(192.1.1.1, 225.0.0.1), protos: 0x8, flags: 0x0, 00:10:18/00:03:18
Incoming interface : Vlan1, RPF Nbr 0.0.0.0, pref 0, metric 0
Outgoing interface list:
(Vlan2), protos: 0x2, UpTime: 00:10:18, Exp:00:03:18
Switch #

Showing information	explanation
(192.1.1.1, 225.0.0.1)	forwarding items
Incoming interface	ingress interface (RPF interface)
Outgoing interface list	egress interface list

14.4.3.1.4 show ip pim neighbor

Command: **show ip pim neighbor [<*ifname*>]**

Function: show nerighbor information of pim interface

Parameter: ***<ifname>*** is the name of interface which is to show pim neighbor information of designated interface

Default: not to show

Command mode: auithorized user configuration mode

User guide: if no entering interface name, show pim neighbor information of all ports

Example: show pim neighbor information in all interfaces (not entering interface name)

Switch # show ip pim neighbor

Neighbor-Address	Interface	ifIndex	Uptime	Expires	DR-state
192.3.1.3	Vlan1	28	00:11:39	00:01:16	DR
192.2.1.1	Vlan2	31	00:11:39	00:01:16	/
192.4.1.4	Vlan4	33	00:11:39	00:01:44	DR
192.4.1.3	Vlan4	33	00:11:39	00:01:17	/

Switch #

Showing information	explanation
Neighbor-Address	Neighbor address
Interface	Interface which find out this neighbor
ifIndex	interface index number
Uptime	The time of his beighbor has existed
Expires	the time left until the timeout of this neighbor
DR-state	if this neighbor is a DR

14.4.3.1.5 show ip pim rp

Command: **show ip pim rp** [**mapping** | ***group-address***]

Function: show PR related information of PIM

Parameter: **mapping** show the corresponding relations of group address and rp; ***group-address*** is group address

Default: not to show

Command mode: privilege user configuration mode

Example: show RP information in group PIM area

Switch #show ip pim rp 226.1.1.1

RP Address for this group is: 192.2.1.1

Showing information	explanation
RP Address	IP address of this group

14.4.3.1.6 debug ip pim

Command: **debug ip pim**

Function: enable the debugging switch to show pim detail information; no command is to disable debugging switch

Parameter: none

Default: disable

Command mode: privilege user configuration mode

User guide: if uer nee to check the detail information of pim message, etc, please enable this debugging switch

Example:
Switch # debug ip pim
PIM debug is on
00:17:52: PIM: Received v2 Join/Prune on Vlan2 from 192.3.1.3 to 192.3.1.2
00:17:52: PIM: Receive Join-list: (192.1.1.1/32, 225.0.0.1/32), S-bit set
00:17:54: PIM: Received v2 Hello on Vlan4 from 192.4.1.4, holdtime 105
00:17:57: PIM: Received v2 Hello on vlan3 from 192.2.1.1, holdtime 105
00:17:57: PIM: Received v2 Hello on Vlan2 from 192.3.1.3, holdtime 105
00:17:58: PIM: Received v2 Hello on Vlan4 from 192.4.1.3, holdtime 105
00:18:21: PIM: Send v2 Hello on vlan2, holdtime 105
00:18:21: PIM: Send v2 Hello on vlan4, holdtime 105
00:18:21: PIM: Send v2 Hello on vlan3, holdtime 105
00:18:21: PIM: Send v2 Hello on Vlan4, holdtime 105
00:18:21: PIM: Send v2 Hello on Vlan2, holdtime 105

14.4.3.1.7 debug ip pim bsr

Command: **debug ip pim bsr**
Function: enable the debugging switch to show PIM Candidate-RP/BSR information; no command is to disable debugging switch
Parameter: none
Default: disable
Command mode: privilege user configuration mode
User guide: if uer nee to check the detail information of PIM Candidate-RP/BSR message, etc, please enable this debugging switch
Example:
Switch # debug ip pim bsr
PIM BSR debug is on
00:16:23: PIM: Received v2 BSR on Vlan4 from 192.4.1.3
00:16:23: PIM: Receive BSR fragtag 6879, hmlen: 30, pri: 192
00:16:23: PIM: Receive BSR Group (225.0.0.1, 0.0.0.0): rpcount: 1, fragcount: 1
00:16:23: PIM: C-RP 192.2.1.1, holdtime 130, C-RP pri 192
00:16:23: PIM: Transmit the BSR message on Vlan2
00:16:23: PIM: Transmit the BSR message on vlan4
00:16:23: PIM: Transmit the BSR message on vlan3
00:16:23: PIM: Transmit the BSR message on vlan2

14.4.3.2 PIM-SM troubleshooting help

On configuration and application PIM-SM protocol, PIM-SM protocol might not be able to work normally due to faulty physical connetion, error configuration, etc, so pelase pay attention to following points:

- ✧ First, ensure all physical connection are correct
- ✧ Secondly, ensure ports and link protocols are UP (use show interface command)
- ✧ Multicast protocol need to use unicast routing to operate RPF checking , so please ensure the correctness of unicast routing
- ✧ PIM-SM protocol needs IP and bsr supports, so firstly use **show ip pim bsr-router** command to check if there is bsr information; if not, please check if there is unicast routes leading to bsr

✧ Use **show ip pim rp** command to check if rp information is correct; if there is not rp information, please check unicast routing

If PIM-SM problem still exist after above checking steps, we can use debug ip pim/ debug ip pim bsr command, and copy the DEBUG information in 3 minutes and send it to KYLAND technical service center.

14.5 DVMRP

14.5.1 DVMRP configuraiton

14.5.1.1 task sequence of DVMRP configuration

1. enable DVMRP (mandatory)
2. configure DVMRP assistant parameter (optional)

1) configure DVMRP interface parameter

a) configure the intercommunication with its CISCO neighbor

b) configure metric value of DVMRP report message

c) configure the timeout of DVMRP neighbor

d) configure DVMRP tunnel

2) configure DVMRP global parameter

a) configure the interval of sending graft message

b) configure the interval of sending probe message

c) configure the interval of sending routing reports

d) configure routing aging time

3. disable DVMRP protocol

14.5.1.2 DVMRP configuration commands

1. enable DVMRP protocol

It is simple to operate DVMRP protocol in KYLAND series layer 3 switch, just turning on DVMRP switch in corresponding interface

Command	explanation
Interface configuration mode	
[no] ip dvmrp enable	enable DVMRP protocol; no command is to disable DVMRP protocol (mandatory)

2.configure DVMRP assistant parameter

1) configure DVMRP interface parameter

a) configure the intercommunication with its CISCO neighbor

Command	explanation
Interface configuration mode	
ip dvmrp cisco-compatible <*remote-address*> **no ip dvmrp cisco-compatible <*remote-address*>**	Configure to intercommunicate with its CISCO neighbor; no command is to cancel its CISCO neighbor

b)configure the metric value of DVMRP report messge

Command	explnantion
Interface configuration mode	
ip dvmrp metric <*metric-val*> **no ip dvmrp metric**	configure the metric value of DVMRP report messge; no command is to restore default value

c)configure the timeout of DVMRP neighbor

Command	explanation
Interface configuration mode	
ip dvmrp nbr-timeout <*seconds* > no ip dvmrp nbr-timeout	configure the timeout of DVMRP neighbor; no command is to restore default value

d)configure DVMRP tunnel

Command	explanation
Interface configuration mode	
ip dvmrp tunnel <*remote-address*> [metric <*metric*>] no ip dvmrp tunnel	configure DVMRP tunnel; no command is to delete DVMRP tunnel

2)configure DVMRP global parameters

a) configure the interval of sending graft message

Command	explanation
Interface configuration mod e	
ip dvmrp graft-interval <*seconds*> no ip dvmrp graft-interval	configure the interval of sending DVMRP graft message; no command is to restore default interval of sending graft message

b)configure the interval of sending probe message

Command	explanation
Interface configuration mode	
ip dvmrp probe-interval <*seconds*> no ip dvmrp probe-interval	configure the interval of sending DVMRP probe message; no command is to restore default interval of sending probe message

c) configure the interval of sending routing report message

Command	explanation
Interface configuration mod e	
ip dvmrp report-interval <*seconds*> no ip dvmrp report-interval	configure the interval of sending DVMRP routing report message; no command is to restore default interval of sending routing report message

d) configure routing aging time

Command	explanation
Interface configuration mode	
ip dvmrp route-timeout <*seconds*> no ip dvmrp route-timeout	configure DVMRP routing aging time; no command is to restore DVMRP routing aging time

3.disable DVMRP protocol

Command	explanation
Interface configuration mod e	

no ip dvmrp enable	Disable DVMRP protocol

14.6 IGMP

14.6.1 IGMP configuration

14.6.1.1 task sequence of IGMP configuration

1. enable IGMP (mandatory)
2. configure IGMP assistant parameters (optional)
    1) configure IGMP group parameters
        a) configure IGMP group filtering conditions
        b) configure IGMP to add into a group
        c) configure IGMP to add into a static group
    2) configure IGMP query parameters
        a) configure the interval of IGMP sending query message
        b) configure the max response time of interface to IGMP query
        c) configure the timeout of IGMP query
    3) configure IGMP version
3. disable IGMP protocol

1. enable IGMP protocol

There is not a special command to enable IGMP protocol; if any kind of multicast protocol is enabled in interface, IGMP will be automatically enabled.

Command	explanation
Interface configuration mod e	
ip dvmrp enable | ip pim dense-mode | ip pim sparse-mode	enable IGMP protocol; no command is to disable IGMP protocol (mandatory)

2. configure IGMP assistant parameters

1) configure IGMP group parameter
    a) configure IGMP group filtering conditions
    b) configure IGMP to add into a group
    c) configure IGMP to add into a static group

Command	explanation
Interface configuration mod e	
ip igmp access-group {<*acl_num* | *acl_name*>} **no ip igmp access-group**	configure interface filtering conditions for IGMP group; no command is to cancel filtering conditions
ip igmp join-group <*A.B.C.D* > **no ip igmp join-group <*A.B.C.D* >**	configure interface to add into a IGMP group; no command is to cancel adding
ip igmp static-group <*A.B.C.D* > **no ip igmp static -group <*A.B.C.D* >**	configure interface to add into a IGMP static group; no command is to cancel adding

2) configure IGMP query parameters
    a) configure the interval of IGMP sending query message
    b) configure the max response time of interface to IGMP query

c) configure the timeout of IGMP query

Command	explanation
Interface configuration mode	
ip igmp query-interval <*time_val*> **no ip igmp query-interval**	configure the interval of regularly sending IGMP query message; no command is to restore default value
ip igmp query-max-response-time <*time_val*> **no ip igmp query-max-response-time**	configure the max response time of IGMP query; no command is to restore default value
ip igmrp query-timeout <*time_val*> **no ip igmp query-timeout**	configure the timeout of IGMP query; no command is to restore default value

3) configure IGMP version

Command	explanation
Global configuration mode	
ip igmp version <*version*> **no ip igmp version**	Configure IGMP version of interface; no command is to restore default value

3. disable IGMP protocol

Command	explanation
Interface configuration mod e	
no ip dvmrp enable | no ip pim dense-mode | no ip pim sparse-mode	Disable IGMP protocol

14.6.1.2 IGMP configuration commands

- **ip igmp access-group**
- **ip igmp join-group**
- **ip igmp query-interval**
- **ip igmp query-max-response-time**
- **ip igmp query-timeout**
- **ip igmp static-group**
- **ip igmp version**
- **show ip igmp groups**
- **show ip igmp interface**
- **debug ip igmp event**
- **debug ip igmp packet**

14.6.1.2.1 ip igmp access-group

Command: **ip igmp access-group {<*acl_num* | *acl_name*>}**

no ip igmp access-group

Function: configure filtering conditions of IGMP group in interface; no command is to cancel filtering conditions

Parameter: **{<*acl_num* | *acl_name*>}** is the number or name of access list; the range of ***acl_num*** is 1~99

Default: there are not filtering conditions

User guide: configure interface to filter group, allowing or deny the addition of group

Example: configure vlan1 to receive group 224.1.1.1, and deny group 224.1.1.2

Switch (Config)#access-list 1 permit 224.1.1.1 0.0.0.0

Switch (Config)#access-list 1 deny 224.1.1.2 0.0.0.0

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip igmp access-group 1

14.6.1.2.2 ip igmp join-group

Command: **ip igmp join-group <*A.B.C.D* >**

no ip igmp join-group <*A.B.C.D* >

Function: configure interface to add into a IGMP group; no command is to cancel addition

Parameter: **<*A.B.C.D* >** is group address

Default: do not add into group

Command mode: interface configuration mode

User guide: when switch work as HOST, use this command to configure HOST to add into a group; it means that if configure this interface to group 224.1.1.1, when switch reveice IGMP group query from other switches, switch will send IGMP member reports which contain group 224.1.1.1.

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip igmp join-group 224.1.1.1

14.6.1.2.3 ip igmp query-interval

Command: **ip igmp query-interval <*time_val*>**

no ip igmp query-interval

Function: configure the interval of regularly sending IGMP quey message; no command is to restore default value

Parameter: **<*time_val*>** is the interval of regularly sending IGMP query message in a range of 1~65535s

Default: the default interval of regularly sending IGMP query message is 125s

Command mode: interface configuration mode

User guide: when a interface enable a kind of multicast protocol, it will regularly send IGMP query message; this command is to configure this query interval.

Example: set the interval of sending IGMP query message is 10s

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip igmp query-interval 10

14.6.1.2.4 ip igmp query-max-response-time

Command: **ip igmp query-max-response-time <*time_val*>**

no ip igmp query- max-response-time

Function: configure the max response time of interface to IGMP query; no command is to restore defult value

Parameter: **<*time_val*>** is the max response time of interface to IGMP query in a range of 1~25s

Default: the max response time is 10s

Command mode: interface configuration mode

User guide: when switch receive a query message, host will set a timer for each multicast group which host belong to; the timer value will be selected in a range of 0 to mas response time; when the value of any timer reduce to 0, host will send its multicast group member report; a reasonable max response time make switch fast respond to query information and make router learnthe situation of multicast group members

Example: configure the max response time to IGMP query message to 20s

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip igmp query- max-response-time 20

14.6.1.2.5 ip igmp query-timeout

Command: **ip igmp query-timeout <*time_val*>**

no ip igmp query-timeout

Function: configure the timeout of IGMP query; no command is to restore default value

Parameter: **<*time_val*>** is the timeout of IGMP query in a range of 60~300s

Default: 265s

Command mode: interface configuration mode

User guide: in shared network, if there are multi switches which operate IGMP, select one of switches to be a query device in this shared network and other switches serve as timers to monitor the state of query device; if they do not receive query messages from query device within the timeout, they will select another switch to be a new query device.

Example: configure the timeout of IGMP query to 100s

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip igmp query-timeout 100

14.6.1.2.6 ip igmp static-group

Command: **ip igmp static-group <*A.B.C.D* >**

no ip igmp static -group <*A.B.C.D* >

Function: configure a interface to add into a IGMP static group; no command is to cancel addition

Parameter: **<*A.B.C.D* >** is group address

Default: not to add into static groups

Command mode: interface configuration mode

User guide: after configuring a interface to add into a static group, whatever the interface is a actual receiver or not, it will receive multicast packets of this static group; it means if configure this interface to add into static group 224.1.1.1, this interface will keep receiving multicast messages of group 224.1.1.1, whatever this interface is the actual receiver or not; please pay attention to the differences between this command and **ip igmp join-group** command

Example: add vlan1 into static group 224.1.1.1

Switch (Config)#interface vlan 1

Switch(Config-If-Vlan1)#ip igmp static-group 224.1.1.1

14.6.1.2.7 ip igmp version

Command: **ip igmp version <*version*>**

no ip igmp version

Function: configure IGMP version of interface; no command is to restore default value

Parameter: **<*version*>** is the configured IGMP version, supporting version1 and version2 at present

Default: supporting version2

Command mode: interface configuration mode
User guide: version1 and version2 are not compatible, so we must use same version is a network.
Example: configure the IGMP version to 1
Switch (Config)#interface vlan 1
Switch(Config-If-Vlan1)#ip igmp version 1

14.6.2 IGMP typical example

as below figure, add ethernet ports of SWITCHA and SWITCHB to corresponding vlan, and enable PIM-DM in each valn interface

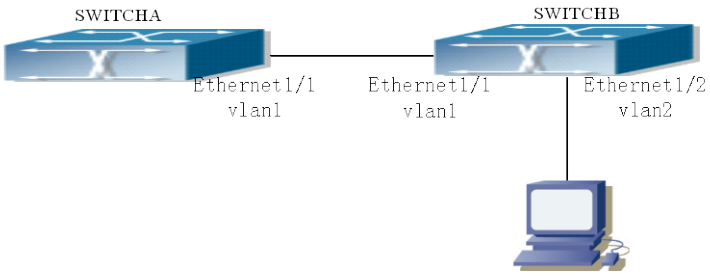


Figure 14-3 IGMP network topology

The configuration steps of SWITCHA and SWITCHB are as follows:
(1) SWITCHA configuration
Switch (Config)#interface vlan 1
Switch(Config-If-Vlan1)#ip pim dense-mode
(2) SWITCHB configuration
Switch(Config)#interface vlan1
Switch(Config-If-Vlan1)#ip pim dense-mode
Switch(Config-If-Vlan1)#exit
Switch(Config)#interface vlan2
Switch(Config-If-Vlan2)#ip pim dense-mode
Switch(Config-If-Vlan2)#ip igmp version 1
Switch(Config-If-Vlan2)#ip igmp query-timeout 150

14.6.3 IGMP troubleshooting help

1. monitoring and debugging commands
2. IGMP troubleshooting help

14.6.3.1 monitoring and debugging command

14.6.3.1.1 show ip igmp groups

Command: **show ip igmp groups [{*<ifname | group_addr>*}]**
Function: show IGMP group information
Parameter: ***<ifname>*** is the name of interface, checking group information of designated interface; ***<group_addr>*** is group address, checking information of designated group
Default: not to show
Command mode: privilege user configuration mode
Example:
Switch#show ip igmp groups
IGMP Connect Group Membership (1 group(s) joined)
Group Address Interface Uptime Expires Last Reporter

239.255.255.250 Vlan123 02:57:30 00:03:36 123.1.1.2
Switch#

Showing informaiton	explanantion
Group Address	IP address of multicast group
Interface	interface which multicast group belongs to
Uptime	the time that multicast group has existed
Expires	the time left to the timeout of multicast group
Last Reporter	the host which is the last one to report this multicast group

14.6.3.1.2 show ip igmp interface

Command: **show ip igmp interface [<*ifname*>]**
Function: showing IGMP information of interface
Parameter: ***<ifname>*** is the name of interface, showing IGMP information os designated interface
Default: not to show
Command mode: privilege user configuration mode
Example: showing IGMP information of vlan1
Switch # show ip igmp interface vlan1
Vlan1 is up, line protocol is up
Internet address is 192.168.1.11, subnet mask is 255.255.255.0
IGMP is enabled, I am querier
IGMP current version is V2
IGMP query interval is 125s
IGMP querier timeout is 265s
IGMP max query response time is 10s
Inboud IGMP access group is not set
Multicast routing is enable on interface
Multicast TTL threshold is 1
Multicast designed router (DR) is 192.168.1.22
Muticast groups joined by this system: 0

14.6.3.1.3 debug ip igmp event

Command: **debug ip igmp event**
Function: enable debugging switch oto show IGMP events; no command is to disable this debugging switch
Parameter: none
Default: dissbled
Command mode: privilege user configuration mode
User guide: if we need to check IGMP events information, please enable this switch
Example:
Switch# debug ip igmp event
igmp event debug is on
Switch# 01:04:30:56: IGMP: Group 224.1.1.1 on interface vlan1 timed out

14.6.3.1.4 debug ip igmp packet

Command: **debug ip igmp packet**

Function: enable debugging switch to show information of IGMP messages; no command is to disable this debugging switch

Parameter: none

Default: disable

Command mode: privilege user configuration mode

User guide: if we need to check information of IGMP messages, please enable this debugging switch

Example:

Switch# debug ip igmp packet

igmp packet debug is on

Switch #02:17:38:58: IGMP: Send membership query on dvmrp2 for 0.0.0.0

02:17:38:58: IGMP: Received membership query on dvmrp2 from 192.168.1.11 for 0.0

.0.0

02:17:39:26: IGMP: Send membership query on vlan1 for 0.0.0.0

02:17:39:26: IGMP: Received membership query on dvmrp2 from 192.168.1.11 for 0.0

.0.0

14.6.3.2 IGMP troubleshooting help

On configuration and application IGMP protocol, IGMP protocol might not be able to work normally due to faulty physical connetion, error configuration, etc, so pelase pay attention to following points:

- ✧ First, ensure all physical connection are correct
- ✧ Secondly, ensure ports and link protocols are UP (use show interface command)
- ✧ Then, ensure to enable a kind of multicast protocol
- ✧ Multicast protocol need to use unicast routing to operate RPF checking , so please ensure the correctness of unicast routing

If IGMP problem still exist after above checking steps, we can use debug ip igmp event/packet command, and copy the DEBUG information in 3 minutes and send it to KYLAND technical service center.

14.7 WEB management

Click Device Advanced Configuration→Multicast Protocol Configuration to configure multicast protocol. User can configure multicast protocol through WEB page.

Click “Multicast Commom Configuration” to enter multicast protocol common monitoring mode

Click “PIM-DM Configuration” to enter PIM-DM protocol configuration mode

Click “PIM-SM Configuration” to enter PIM-SM protocol configuration mode

Click “DVMRP Configuration” to enter DVMRP protocol configuration mode

Click “IGMP configuration” to enter IGMP protocol configuration mode

Click “Inspect and Debug” to enter multicast protocol debugging and monitoring mode

14.7.1 Multicast Common Configuration

In multicast common configuation mode, click “Show IP Route” to show IP multicast message forwarding items. there is not configuration parameters. Detail information is presented in the following figure:

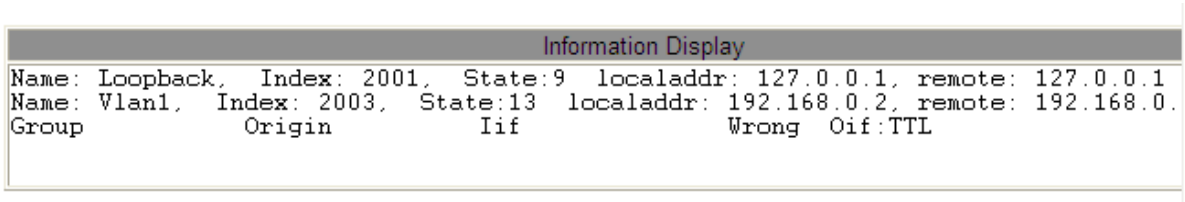


Figure 14-4 show multicast routing

14.7.2 PIM-DM Configuration

In PIM-DM protocol configuration mode, click "Enable PIM-DM" to enable/disable PIM-DM protocol in layer 3 interface

Vlan port- specify layer 3 interface (select in pull down menu)

Enable PIM-DM—Open/Close PIM-DM protocol

Apply—operating with setting parameters

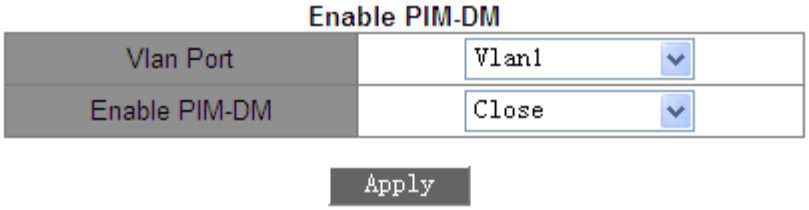


Figure 14-5 enable PIM-DM

Click "PIM-DM parameter configuration" to set the PIM-DM operation parameters of designated layer 3 interface

Query-Interval—set the interval of PIM-DM hello message

Vlan port—specify layer 3 interface (select in pull down menu)

Reset —clear the configuration in page

Apply—operating with setting parameters

Default-- restore the interval of PIM-DM hello message to default value

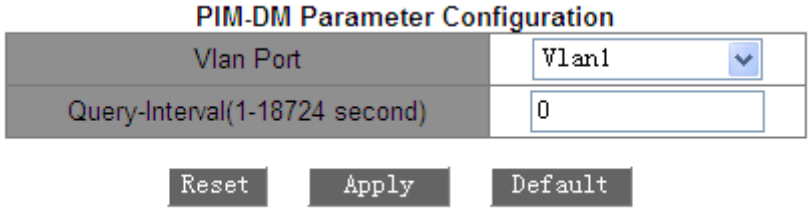


Figure 14-6 configure PIM-DM assistant parameters

14.7.3 PIM-SM configuration

In PIM-SM protocol configuration mode, click "Enable PIM-SM " to enable/disable PIM-SM protocol in layer 3 interface

Vlan port—specify layer 3 interface (select in pull down menu)

Enable PIM-SM—Open/Close PIM-SM protocol

Apply—operating with setting parameters

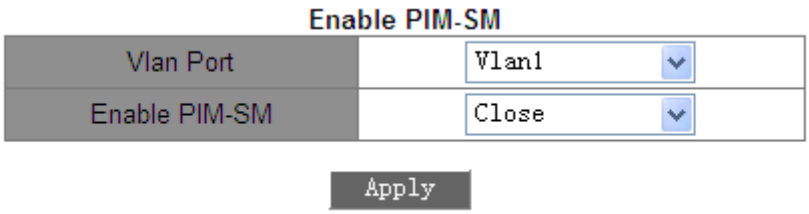


Figure 14-7 enable PIM-SM protocol

Click “PIM-SM parameter configuration” to set the PIM-SM operation parameters of designated layer 3 interface

Vlan port—specify layer 3 interface (select in pull down menu)

Query-Interval—set the interval of PIM-SM hello message

Reset—clear the configuration in page

Apply—operating with setting parameters

Default-- restore the interval of PIM-SM hello message to default value

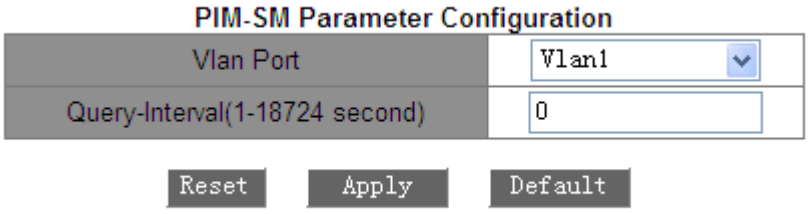


Figure 14-8 configure PIM-SM assistant parameters

Click “Set interface as PIM-SM BSR border” to configure PIM-SM area border to prevent the flooding of BSR message to other areas. Specify a interface to PIM-SM area border, inclucing

Vlan port—specify layer 3 interface (select in poll-down menu)

Set—operating with setting parameters

Cancel—cancel this interface to be PIM-SM area border

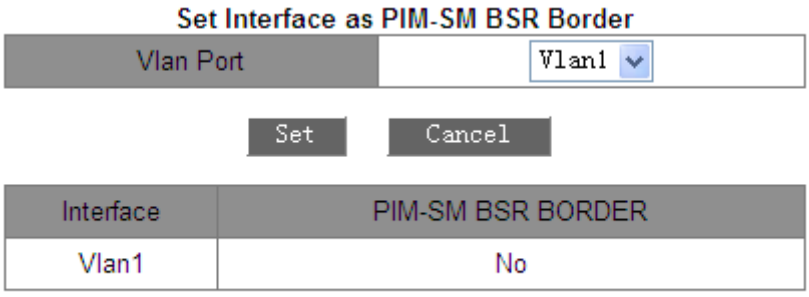


Figure 14-9 configure interface to be PIM-SM BSR border

Click “Set interface as BSR candidate” to configure the information of PIM-SM BSR candidate to compete for BSR router with other candidates, including:

Vlan port—specify layer 3 interface VLAN ID (select in pull-down menu)

Hash mask length—specify the length of hash mask

Priority—specify priority

Set—operating with setting parameters

Cancel—cancel this layer 3 interface to be BSR candidate

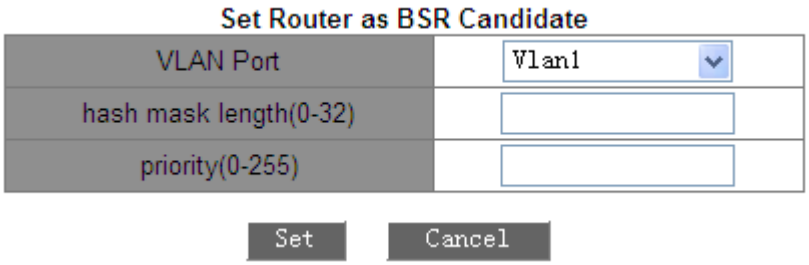


Figure 14-10 configure switch to be BSR candidate

Click “Set Router as RP Candidate” to configure the information of PIM-SM RP candidate to compete for RP router with other candidates, including:

VlanPort—specify layer 3 interface VLAN ID (select in pull-down menu)

Group-List—specify access-list number

Interval—specify the interval of sending RP candidate message

Reset—clear configuration in page

Set—operating with setting parameters

Cancel—cancel the switch to be RP candidate

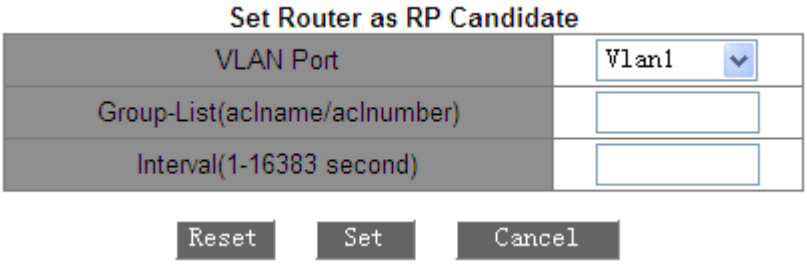


Figure 14-11 canfigure switch to be RP candidate

14.7.4 DVMRP configuration

In DVMRP protocol configuration mode, click “Enable DVMRP” to enable/disable DVMRP protocol, inclucing

Enable DVMRP protocol—enable or disable DVMRP protocol

Vlan port—specify layer 3 interface (select in pull-down menu)

Apply—operating with setting parameters

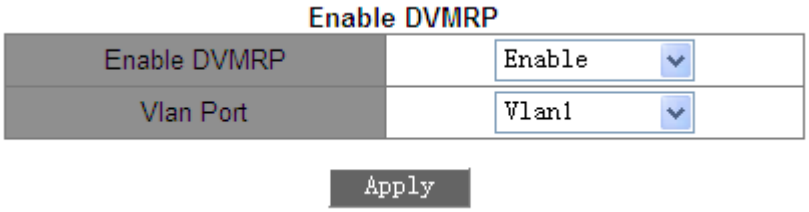


Figure 14-12 enbale DVMRP protocol

Cilick “Cisco-compatible Configuration” to enable the intercommunication with CISCO neighbor, including

CISCO neighbor’s IP address—specify IP address of CISCO neighbor

Vlan port—specify layer 3 interface (select in pull-down menu)

Reset—clear configuration in page

Apply—operating with setting parameters

Delete—delete the intercommunication configuration with CISCO

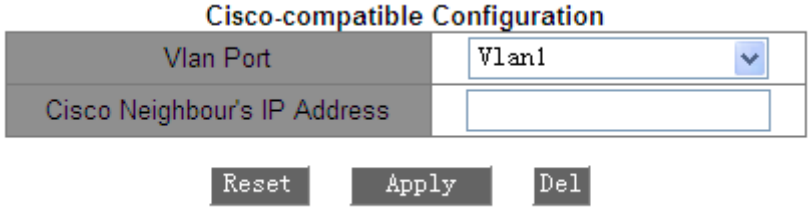


Figure 14-13 Configure the intercommunication with CISCO

Click “DVMRP parameter configuration” to set dvmrp protocol interface configuration parameters, including

Vlan port—specify layer 3 interface (select in pull-down menu)

DVMRP report metric configuration

DVMRP neighbor timeout configuration

Reset—clear configuration in page

Apply—operating with setting parameters

Default-- set interface parameters (including metric value of report message, the timeout of neighbor) to be default values

Attention: this page corresponds to two CLI commands, so when setting one of parameters, it will inform that the other parameter is wrong, but it does not affect the use.

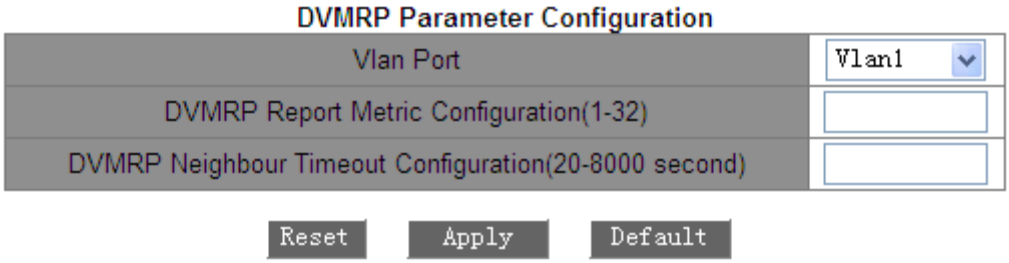


Figure 14-14 configure DVMRP interface parameters

Click “DVMRP global parameter configuration” to configure dvmrp protocol global configuration parameters, including

DVMRP graft interval configuration

interval of sending probe packet

interval of sending report packet

DVMRP route timeout

Reset—clear configuration in page

Apply—operating with setting parameters

Default-- set global configuration parameters (including the interval of sending graft, probe, report messges and the timeout of dvmrp routing) to be default values

Attention: this page corresponds to four CLI commands, so when setting one of parameters, it will inform that other parameters are wrong, but it does not affect the use.

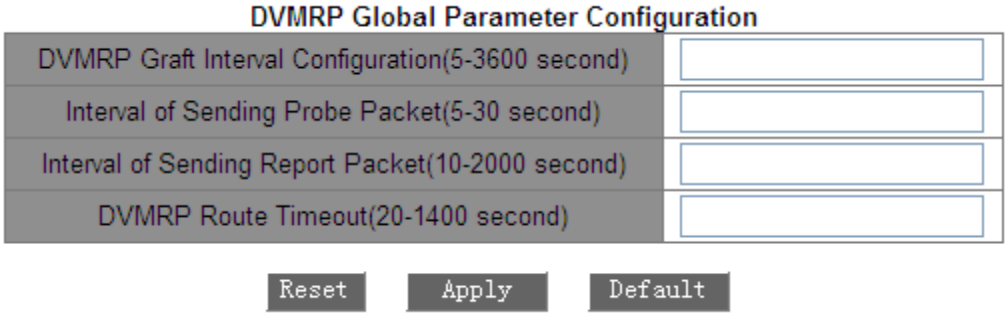


Figure 14-15 configrue DVMRP global parameters

Click "DVMRP tunnel configuration" to create or cancel DVMRP tunnels leading to designated neighbor, including

Vlan port—specify layer 3 interface (select in pull-down menu)

Neighbor IP address—specify IP address of neighbor

Metric—specify the cost of leading to neighbors

Reset—clear configuration in page

Apply—create a DVMRP tunnel to designated neighbor

Delete—cancel the DVMRP tunnel to designated neighbor

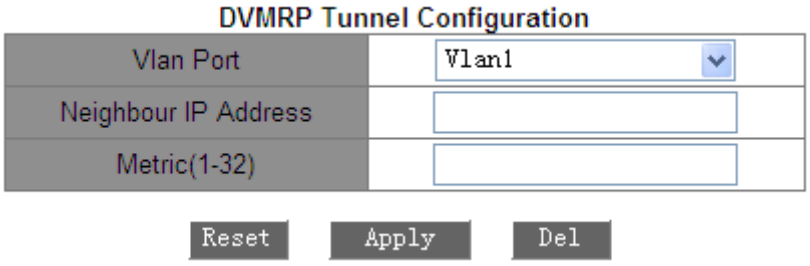


Figure 14-16 configure DVMRP tunnel

14.7.5 IGMP Configuration

In IGMP protocol configuration mode, click "IGMP group parameter configuration" to configure the parameters of IGMP protocol group, inclucing

VLAN port—specify lauer 3 interface (select in pull-down menu)

Set ACL for IGMP Group

Add interface to IGMP group

Add IGMP static group to VLAN

Reset—clear configuration in page

Apply—create a DVMRP tunnel to designated neighbor

Cancel—cancel the interface addition

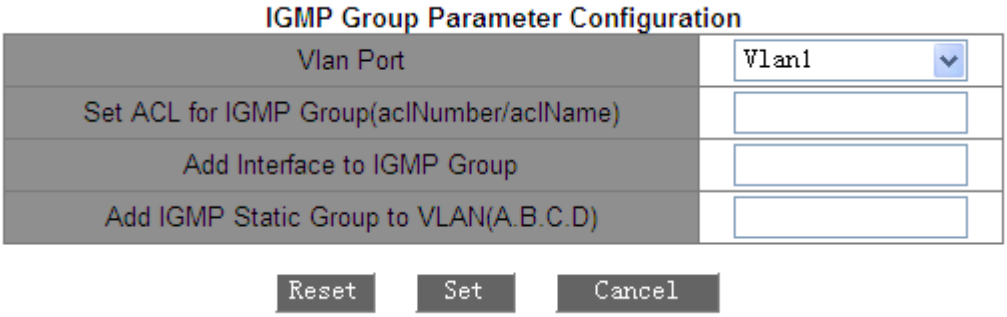


Figure 14-17 Configure IGMP group parameters

In IGMP protocol configuration mode, click “IGMP query parameter configuration” to configure igmp protocol query parameters, including

VLAN port—specify a layer 3 interface (select in pull-down menu)

IGMP query interval

Max response IGMP Request time

IGMP query timeout

Reset—clear configuration in page

Apply—operating with setting parameters

Default- restore the interface query parameters to deault values

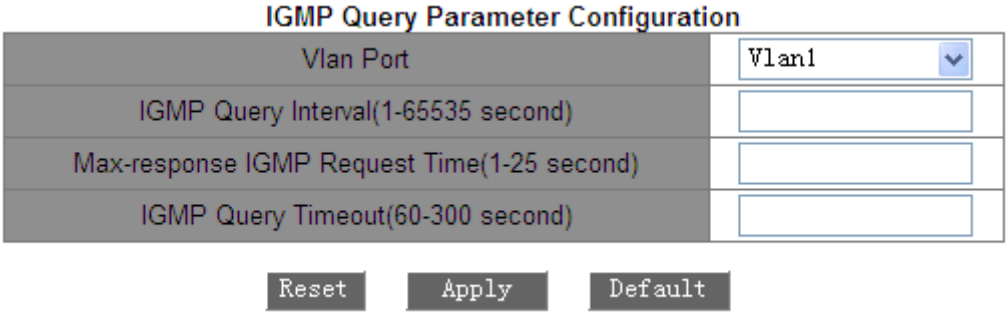


Figure 14-18 Configure IGMP query parameters

Click “IGMP version configuration” to configure interface IGMP protocol version, including

VLAN port—specify a layer 3 interface (select in pull-down menu)

IGMP version configuration—setting version number

Reset—clear configuration in page

Apply—operating with setting parameters

Default-- restore the interface IGMP version to deault values

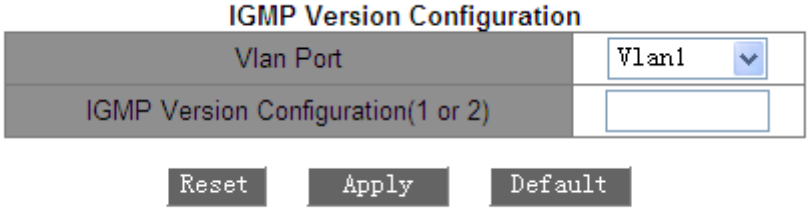


Figure 14-19 Configure IGMP version

14.7.6 Inspect and Debug multicast

Click Insect and Debug→Show IP PIM interface" to show the information of interface operating pim protocol

Click "Show IP PIM Mroute dm" to show information of multication routing which operate PIM-DM protocol

Click "Show IP PIM Neighbor" to show information of neighbor which operate PIM protocol

Click "ShowIP PIM Bsr-router" to show information of BSR which operate PIM-SM protocol

Click "ShowIP PIM Mroute SM" to show information of multicast routing which operate PIM-SM protocol

Click "Show IP PIM RP" to show information of corresponding PIM-SM RP information according to group address

Click "Show IPDVMRP Mroute" to show information of multicast routing which operate DVMRP protocol

Click "Show IP DVMRP Neighbor" to show information of neighbor which operate DVMRP protocol

Click "ShowIP DVMRP Route" to show information of unicast routing which operate DVMRP protocol

Click "Show IP DVMRP Tunnel" to show information of tunnel which operate DVMRP protocol

Chapter 15 MSTP Configuration

15.1 MSTP

15.2 MSTP configuration

15.2.1 task sequence of MSTP configuration

1. enable MSTP and se the operation mode
2. configure case parameters
3. configure MSTP domain parameters
4. configure MSTP time parameters
5. configure MSTP fast movement feature

1. Enable MSTP and set operation mode

Command	explanation
global configuration mode and interface configuration mode	
spanning-tree **no spanning-tree**	Enable and disable MSTP protocol
global configuration mode	
spanning-tree mode {mstp|stp} **no spanning-tree mode**	Set MSTP operation mode
interface configuration mode	
spanning-tree mcheck	Forcibly move port to operate in MSTP mode

2. Configure instance parameters

Command	explanantion
global configuration mode	
spanning-tree mst *<instance-id>* priority *<bridge-priority>* **no spanning-tree mst *<instance-id>* priority**	set bridge priority of switch in designated instance
interface configuration mode	
spanning-tree mst *<instance-id>* cost *<cost>* **no spanning-tree mst *<instance-id>* cost**	Set port path cost of current port in designated instance
spanning-tree mst *<instance-id>* port-priority *<port-priority>* **no spanning-tree mst *<instance-id>* port-priority**	set port priority of current port in designated instance。

3. Configure MSTP domain parameters

Command	explanation
global configuration mode	

spanning-tree mst configuration **no spanning-tree mst configuration**	Enter MSTP domain configuration mode; no command is to restore default values of switch MSTP domain parameters
MSTP domain configuration mode	
instance *<instance-id>* vlan *<vlan-list>* **no instance *<instance-id>* [vlan *<vlan-list>*]**	Create instance and configure mapping relationships of VLAN and instance
name *<name>* **no name**	Configrue the name of MSTP domain
revision-level *<level>* **no revision-level**	Configure the revision value of MSTP domain
Abort	Exit from MSTP domain configuration mode and return to global configuration mode; do not save current configuration of MSTP domain
exit	Exit from MSTP domain configuration mode and return to global configuration mode; save current configuration of MSTP domain

4. Configure MSTP time parameter

Command	explanation
global configuration mode	
spanning-tree forward-time *<time>* **no spanning-tree forward-time**	Set the forwarding delay time of switch
spanning-tree hello-time *<time>* **no spanning-tree hello-time**	Set the time of switch sending BPDU hello message
spanning-tree maxage *<time>* **no spanning-tree maxage**	Set the max aging time of switch BPDU message
spanning-tree max-hop *<hop-count>* **no spanning-tree max-hop**	Set BPDU supporting the max number of hops in MSTP domain

5. Configure MSTP fast movement feature

Command	explanation
interface configuration mode	
spanning-tree link-type p2p {auto|force-true|force-false} **no spanning-tree link-type**	Set link type of port
spanning-tree portfast **no spanning-tree portfast**	Set or cancel port to be edge port

15.2.2 MSTP configuration command introduction

15.2.2.1 abort

Command: **abort**

Function: quit MSTP domain configuration and exit from MSTP configuration mode to global configuration mode

Command mode: MSTP domain configuration mode

User guide: use this command to exit from MSTP configuration mode. And the configuration won't take effect this time. The saved configuration last time keep working. "Ctrl+z" is equivalent to abort command, which does not save configuration and directly exit.

Example: exit from MST configuration mode, and does not save configuration

Switch(Config-Mstp-Region)#abort

Switch(Config)#

15.2.2.2 exit

Command: **exit**

Function: save the MSTP domain configuration this time and exit from MSTP domain configuration mode.

Command mode: MSTP domain configuration mode

User guide: when use this command to exit from MST configuration mode, the MSTP domain configuration this time will take effect immediately.

Example: exit from MST configuration mode and save configuration

Switch(Config-Mstp-Region)#exit

Switch(Config)#

15.2.2.3 instance vlan

Command: **instance *<instance-id>* vlan *<vlan-list>***

no instance *<instance-id>* [vlan *<vlan-list>*]

Function: in MSTP domain configuration mode, create instance and configure mapping relationships of VLAN and Instance or add mapping relationships of VLAN and designated instance; no command is to delete designated instance or delete mapping relationships of VLAN and designated Instance

Parameter: for the no command, ***<instance-id>*** is instance number in a range of 0~16; for no command, ***<instance-id>*** is istance number in a range of 1~16; ***<vlan-list>*** is continous or discontinuous VLAN numbers, supporting "-" (continuos) and "," (discontinuous)

Command mode: MSTP domain configuration mode

Default: before creating instance, switch only have instance 0 and VLAN1~VLAN4094 all belong to instance 0

User guide: use this command to set mapping relationships of VLAN and Instance. Only when all mapping realtions are the same and other MSTP domain parameters are the same, switches will think that they are in a same MSTP domain. Before creating instance, all VLAN belong to instance 0. MSTP supports max 16 MSTI (except CIST). We can understand CIST to MIST10, and other instances are MSTI1~16. Specific numbers depends on product specification and 16 is the max number.

Example: configure the relationship of VLAN1-10, 100-110 and Instance 1

Switch(Config)#spanning-tree mst configuration

Switch(Config-Mstp-Region)#instance 1 vlan 1-10;100-110

15.2.2.4 name

Command: **name *<name>***

no name

Function: in MSTP domain configuration mode, configure the name of MSTP domain; no command is to delete MSTP domain name

Parameter: ***<name>*** is the name of MSTP domain, which is a string with max 32 bytes
Command mode: MSTO domain configuration mode
Default: the name of MSTP domain is the switch bridge MAC
User guide: use this command to set MSTP domain name. only when MSTP domain names are the same and other MSTP domain parameters are the same, switches will think that they are in a same MSTP domain
Example: configure the name of MSTP domain to mstp-test
Switch(Config)#spanning-tree mst configuration
Switch(Config-Mstp-Region)#name mstp-test

15.2.2.5 revision-level

Command: **revision-level *<level>***
no revision-level
Function: in MST configuration mode, configure revision value used to calculate MST configuration identifier; no command is to restore default revision value to 0
Parameter: ***<level>*** is revision value in a range of 0~65535
Command mode: MSTP domain configuration mode
Default: default revision value is 0
User guide: use this command to configure revision value used to calculate MST configuration identifier; only when revision values are the same and other MSTP domain parameters are the same, switches will think that they are in a same MSTP domain
Example: set the revision value to 2000
Switch(Config)#spanning-tree mst configuration
Switch(Config-Mstp-Region)# revision-level 2000

15.2.2.6 spanning-tree

Command: **spanning-tree**
no spanning-tree
Function: in switch global configuration mode and interface configuration mode, respectively enable MSTP protocol; no command is to disable MSTP protocol
Command mode: global configuration mode and interface configuration mode
Default: system does not operate MSTP protocol
User guide: if enable MSTP protocol in global configuration mode, except opening the ports which are exclusive with MSTP, and all ports enable MSTP protocol at default
Example: in global mode, enable MSTP and disable MSTP in port 1/2 mode
Switch(Config)#spanning-tree
Switch(Config)#interface ethernet 1/2
Switch(Config-Ethernet1/2)#no spanning-tree

15.2.2.7 spanning-tree forward-time

Command: **spanning-tree forward-time *<time>***
no spanning-tree forward-time
Function: set switch forwarding delay time; no command is to restore default value
Parameter: ***<time>*** is forwarding delay time with the unit of second and in a range of 4~30
Command mode: global configuration mode
Default: the default forwarding delay is 15s
User guide: when network topology change, the port state changes from block to listening, this period

is called forwarding delay. Forwarding delay, Hello time, max aging time are connected with each other. MSTP time parameter configuration must meet the following requirement, otherwise, it will affect MSTP normal working:

2×(Bridge_Forward_Delay – 1.0 seconds) >= Bridge_Max_Age

Bridge_Max_Age >= 2 ×(Bridge_Hello_Time + 1.0 seconds)

Example: configure MSTP forwarding delay to 20s in global configuration mode

Switch(Config)#spanning-tree forward-time 20

15.2.2.8 spanning-tree hello-time

Command: **spanning-tree hello-time *<time>***

no spanning-tree hello-time

Function: set switch Hello time; no command is to restore default value

Parameter: ***<time>*** is Hello time with the unit of second and in a range of 1~10

Command mode: global configuration mode

Default: default Hello time is 2s

User guide: the interval of switch sending BPDU is called Hello time; Hello time and forwarding dealy, max aging time are connected to each other. MSTP time parameter configuration must meet the following requirement, otherwise, it will affect MSTP normal working:

2×(Bridge_Forward_Delay – 1.0 seconds) >= Bridge_Max_Age

Bridge_Max_Age >= 2 ×(Bridge_Hello_Time + 1.0 seconds)

Example: set MSTP hello time to 5s in global mode

Switch(Config)#spanning-tree hello-time 5

15.2.2.9 spanning-tree link-type p2p

Command: **spanning-tree link-type p2p {auto|force-true|force-false}**

no spanning-tree link-type

Function: set the type of link connected with current port; no command is to restore the link type to auto-checking

Parameter: **auto** means system auto-checking link, **force-true** is forced to the type of point to point; **force-false** is forced to the type of non-point to point

Command mode: interface configuration mode

Default: at default, link type is auto; MSTP protocol will automatically check the link type

User guide: when port work in full duplex mode, MSTP protocol will automatically consider that link type is point to point; when port work in half duplex mode, MSTP protocol will automatically think that link type is sharing

Example: force the link type of port 1/7-8 to point to point

Switch(Config)#interface ethernet 1/7-8

Switch(Config-Port-Range)#spanning-tree link-type p2p force-true

15.2.2.10 spanning-tree maxage

Command: **spanning-tree maxage *<time>***

no spanning-tree maxage

Function: set the max aging time of switch BPDU message; no command is to restore default value

Parameter: ***<time>*** is the max aging time with the unit of second and in a range of 6~40

Command mode: global configuration mode

Default: the max aging time is 20s at default

User guide: Life time of BPDU is called max aging time; max aging time and forwarding dealy, Hello

time are connected to each other. MSTP time parameter configuration must meet the following requirement, otherwise, it will affect MSTP normal working:
2×(Bridge_Forward_Delay – 1.0 seconds) >= Bridge_Max_Age
Bridge_Max_Age >= 2 ×(Bridge_Hello_Time + 1.0 seconds)
Example: set max aging time to 25s in global configuration mode
Switch(Config)#spanning-tree maxage 25

15.2.2.11 spanning-tree max-hop

Command: **spanning-tree max-hop *<hop-count>***
no spanning-tree max-hop
Function: set BPDU supporting the max number of hops in transmission in MSTP domain; no command is to restore default value
Parameter: ***<hop-count>*** is the max number of hops in a range of 1~40
Command mode: global configuration mode
Default: the max number of hops is 20 at default
User guide: in MSTP protocol, max-age means the life time of BPDU and in MSTP domain, max-hop also means the life time of BPDU. Max-hop transmission decrease in network; the Max-hop transmitted from root bridge of MSTI is a max value. BPDU is received one time, one hop less of Max-hop value of BPDU each time; when switch port receive BPDU with Max-hop of 0, this port will drop this BPDU and specify this port to send BPDU
Example: set the Max-hop to 32
Switch(Config)#spanning-tree max-hop 32

15.2.2.12 spanning-tree mcheck

Command: **spanning-tree mcheck**
Function: force switch port to move to work in MSTP mode
Command mode: interface configuration mode
Default: port work in MSTP mode
User guide: if there are bridges which are operating IEEE802.1D STP protocol in the network segment which current ethernet port connect with, this port will move to work in STP compatible mode; in network stable condition, the bridges which operate STP protocol in network segment will be cut off, but ports which connect with these bridges and operate MSTP protocol will keep working in STP compatible mode, now we can use this command to force these ports to work in MSTP mode; after these ports are moved to work in MSTP mode, if they receive new STP message again, they will return to work in STP compitable mode
This command must be configured when switch is operating in IEEE802.1s MSTP mode; if switch protocol operation mode is configured to IEEE802.1D STP mode, this command is invalid.
Example: force port 1/2 to move to work in MSTP mode
Switch(Config-Ethernet1/2)#spanning-tree mcheck

15.2.2.13 spanning-tree mode

Command: **spanning-tree mode {mstp|stp}**
no spanning-tree mode
Function: set switch to work in Spanning Tree mode; no command is to restore switch default mode
Parameter: **mstp** is to set switch to operate in IEEE802.1s MSTP mode; **stp** is to set switch operating in IEEE802.1D STP mode
Command mode: global configuration mode

Default: switch operate MSTP mode

User guide: when switch operate in IEEE802.1D STP mode, only standard 802.1D BPDU frame and TCN BPDU can be transmitted, any received MSTP BPDU will be droped.

Example: set swith operating in STP mode

Switch(Config)#spanning-tree mode stp

15.2.2.14 spanning-tree mst configuration

Command: **spanning-tree mst configuration**

no spanning-tree mst configuration

Function: enter switch MST configuration mode; in swtch MST configuration mode, it is able to set switch MSTP domain parameters; no command is to restore default value of switch MSTP domain parameters

Command mode: global configuration mode

Default: before switch entering MST configuration mode, the default MSTP domain parameters are as follows:

MSTP domain parameters	Parameter default value
Instance	only instance 0 exist and VLAN1~4094 are all mapped to instance 0
Name	switch bridge MAC
Revision	0

User guide: whatever switch enable MSTP protocol or not, it is able to enter MSTP domain configuration mode and save configuration; when switch operate MSTP mode, system will calculate switch MST configuration identifier according to MSTP domain parameter; only when MSTP domain cconfiguration identifiers are the same, switches will think that they are in a same MSTP domain and is able to do MSTI calculation

Example: enter switch MST configuration mode

Switch(Config)#spanning-tree mst configuration

Switch(Config-Mstp-Region)#

15.2.2.15 spanning-tree mst cost

Command: **spanning-tree mst *<instance-id>* cost *<cost>***

no spanning-tree mst <instance-id> cost

Function: set port path cost of current port in designated instance; no command is to restore default value

Parameter: ***<instance-id>*** is ID of designated instance in a range of 0~16; ***<cost>*** is path cost value in a range of 1~200,000,000.

Command mode: interface configuration mode

Default: at default, port path cost is related to port bindwidth

Port type	default path cost	recommended value range
10Mbps	2000000	2000000~20000000
100Mbps	200000	200000~2000000
1Gbps	20000	20000~200000
10Gbps	2000	2000~20000

For aggregation port, port path cost is as follows at Default:

Port type	the number of aggregation ports (in allowed range)	default path cost

10Mbps	N	2000000/N
100Mbps	N	200000/N
1Gbps	N	20000/N
10Gbps	N	2000/N

User guide: it is able to control the root path cost form this instance port to root bridge, so as to control the election of this instance root port, designated port, etc

Example: in port 1/2, set path cost of MSTP post corresponding to instance 2

Switch(Config-Ethernet1/2)#spanning-tree mst 2 cost 3000000

15.2.2.16 spanning-tree mst port-priority

Command: **spanning-tree mst *<instance-id>* port-priority *<port-priority>***

no spanning-tree mst *<instance-id>* port-priority

Function: set priority of current port in designated instance; no command is to restore default port priority

Parameter: ***<instance-id>*** is the designated instance ID in a range of 0~16; ***<port-priority>*** is port priority which is the multiple of 16 in a range of 0~240, such as 0, 16, 32, 48..240

Command mode: interface configuration mode

User guide: it is able to control port ID of designated instance through the configuration of port priority, then influence the election of root port, designated port. The smaller the value of port priority is, the higher the priority is.

Example: set port priority of instance 1 to 32 in port 1/2

Switch(Config)#interface ethernet 1/2

Switch(Config-Ethernet1/2)#spanning-tree mst 1 port-priority 32

15.2.2.17 spanning-tree mst priority

Command: **spanning-tree mst *<instance-id>* priority *<bridge-priority>***

no spanning-tree mst *<instance-id>* priority

Function: set the switch bridge priority in designated instance; no command is to restore deault priority value in designated instance

Parameter: ***<instance-id>*** is the designated instance ID in a range of 0~16; ***<bridge-priority>*** is switch priority which is the multiple of 4096 in a range of 0-61440, such as 0, 4096, 8192..61440

Command mode: global configuration mode

Default: the switch default priority is 32768

User guide: it is able to change bridge ID of designated instance through the configuration of switch bridge priority, then use in the election of this instance root bridge, designated port, etc. the smaller the value of switch bridge priority, the higher the priority is.

Example: configure the switch instance 2 priority to 4096

Switch(Config)#spanning-tree mst 2 priority 4096

15.2.2.18 spanning-tree portfast

Command: **spanning-tree portfast**

no spanning-tree portfast

Function: set current port to be edge port; no command is to set current port to non-edge port

Command mode: interface configuration mode

Default: ports are non-edge ports when start to enable MSTP

User guide: when port is set to be edge port, it can be immediately changed from Discarding state to Forwarding state without the need of forwarding delay. Once edge port receives BPDU, this port will

be automatically changed to non-edge port.

Example: configure switch port 1/5-6 to be edge port

Switch(Config)#interface ethernet 15-6

Switch(Config-Port-Range)#spanning-tree portfast

15.3 MSTP Example

MSTP typical example is as follows:

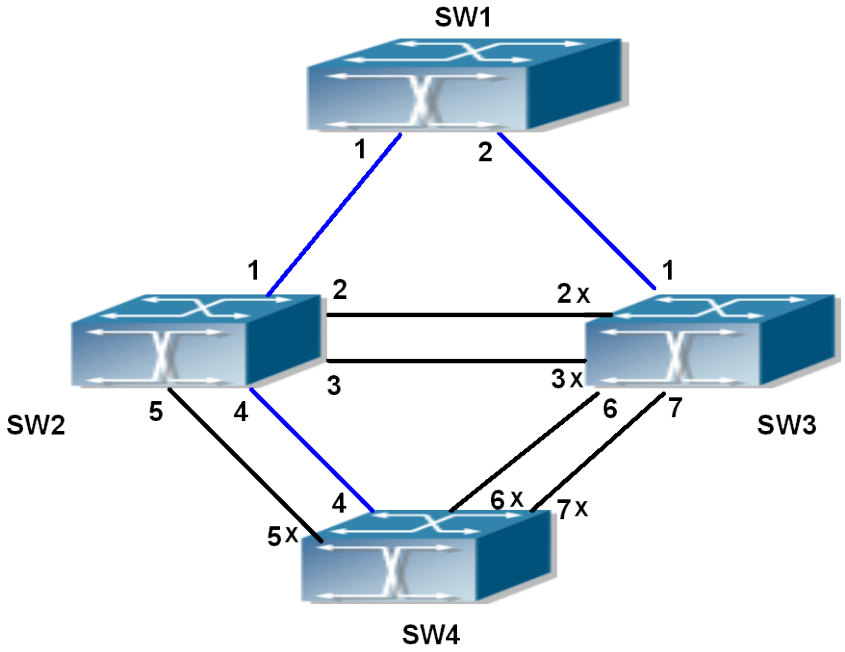


Figure 15-2 MSTP typical configuration example

In above figure, SW1-SW4 are connected as above example, operate MSTP protocol; at default, all switches work in MSTP mode, their bridge priority, port priority, port path cost are all default values (they are the same).default configuration is as follows:

bridge name		SW1	SW2	SW3	SW4
bridge MAC address		…00-00-01	…00-00-02	…00-00-03	…00-00-04
bridge priority		32768	32768	32768	32768
Port priority	port1	128	128	128	
	Port 2	128	128	128	
	Port 3		128	128	
	Port 4		128		128
	Port 5		128		128
	Port 6			128	128
	Port 7			128	128
port path cost	Port 1	200000	200000	200000	
	Port 2	200000	200000	200000	
	Port 3		200000	200000	
	Port 4		200000		200000
	Port 5		200000		200000
	Port 6			200000	200000
	Port 7			200000	200000

At default, MSTP will automatically create a topology in which SW1 serves as root bridge (marked

with blue line), the state of port marked with “x” is Discarding, and other port status are Forwarding
Change configuration:
Step 1: configure mapping relations of port to vlan

- Create vlan20, vlan30, vlan40, vlan50 in SW2, SW3, SW4
- Configure the mode of port 1-7 to trunk in SW2, SW3, SW4

Step 2: configure SW2, SW3, SW4 to a same MSTP domain

- Configure the name of SW2, SW3, SW4 domains to mstp
- In SW2, SW3, SW4, map vlan20 and vlan 30 to instance 3; map vlan40 and vlan 50 to instance 4.

Step 3: configure SW3 to be root bridge of instance 3; configure SW4 to be root bridge of instance 4

- In SW3, configure root priority of instance 3 to 0
- In SW4, configure root priority of instance 4 to 0

Configuration steps are as follows:
SW2:

```
SW2(Config)#vlan 20
SW2(Config-Vlan20)#exit
SW2(Config)#vlan 30
SW2(Config-Vlan30)#exit
SW2(Config)#vlan 40
SW2(Config-Vlan40)#exit
SW2(Config)#vlan 50
SW2(Config-Vlan50)#exit
SW2(Config)#spanning-tree mst configuration
SW2(Config-Mstp-Region)#name mstp
SW2(Config-Mstp-Region)#instance 3 vlan 20;30
SW2(Config-Mstp-Region)#instance 4 vlan 40;50
SW2(Config-Mstp-Region)#exit
SW2(Config)#interface e1/1-7
SW2(Config-Port-Range)#switchport mode trunk
SW2(Config-Port-Range)#exit
SW2(Config)#spanning-tree
```

SW3:

```
SW3(Config)#vlan 20
SW3(Config-Vlan20)#exit
SW3(Config)#vlan 30
SW3(Config-Vlan30)#exit
SW3(Config)#vlan 40
SW3(Config-Vlan40)#exit
SW3(Config)#vlan 50
SW3(Config-Vlan50)#exit
SW3(Config)#spanning-tree mst configuration
SW3(Config-Mstp-Region)#name mstp
SW3(Config-Mstp-Region)#instance 3 vlan 20;30
SW3(Config-Mstp-Region)#instance 4 vlan 40;50
```

```
SW3(Config-Mstp-Region)#exit
SW3(Config)#interface e1/1-7
SW3(Config-Port-Range)#switchport mode trunk
SW3(Config-Port-Range)#exit
SW3(Config)#spanning-tree
SW3(Config)#spanning-tree mst 3 priority 0
```

SW4:

```
SW4(Config)#vlan 20
SW4(Config-Vlan20)#exit
SW4(Config)#vlan 30
SW4(Config-Vlan30)#exit
SW4(Config)#vlan 40
SW4(Config-Vlan40)#exit
SW4(Config)#vlan 50
SW4(Config-Vlan50)#exit
SW4(Config)#spanning-tree mst configuration
SW4(Config-Mstp-Region)#name mstp
SW4(Config-Mstp-Region)#instance 3 vlan 20;30
SW4(Config-Mstp-Region)#instance 4 vlan 40;50
SW4(Config-Mstp-Region)#exit
SW4(Config)#interface e1/1-7
SW4(Config-Port-Range)#switchport mode trunk
SW4(Config-Port-Range)#exit
SW4(Config)#spanning-tree
SW4(Config)#spanning-tree mst 4 priority 0
```

After above configuration, SW1 work as root bridge in instance CIST (instance 0) of the whole network; in MSTP domains of SW2, SW3, SW4, region root of instance 0 is SW2, region root of instance 3 is SW3, region root of instance 4 is SW4; the flow of vlan20 and vlan30 are transmitted along the topology of instance 3, other flow is transmitted along the topology of instance 0; port 1 of SW2 is Master Port of instance 3 and instance 4

The result of MSTP caluculation includes three topologies: instance 0, instance 3, instance4 which are shown in the next figure (marked with blue lines); the status of ports marked with “x” are Discarding; other port status are Forearding; since instance 3 and instance 4 only work in MSTP domain, so the following figure only present their topologies in MSTP domain

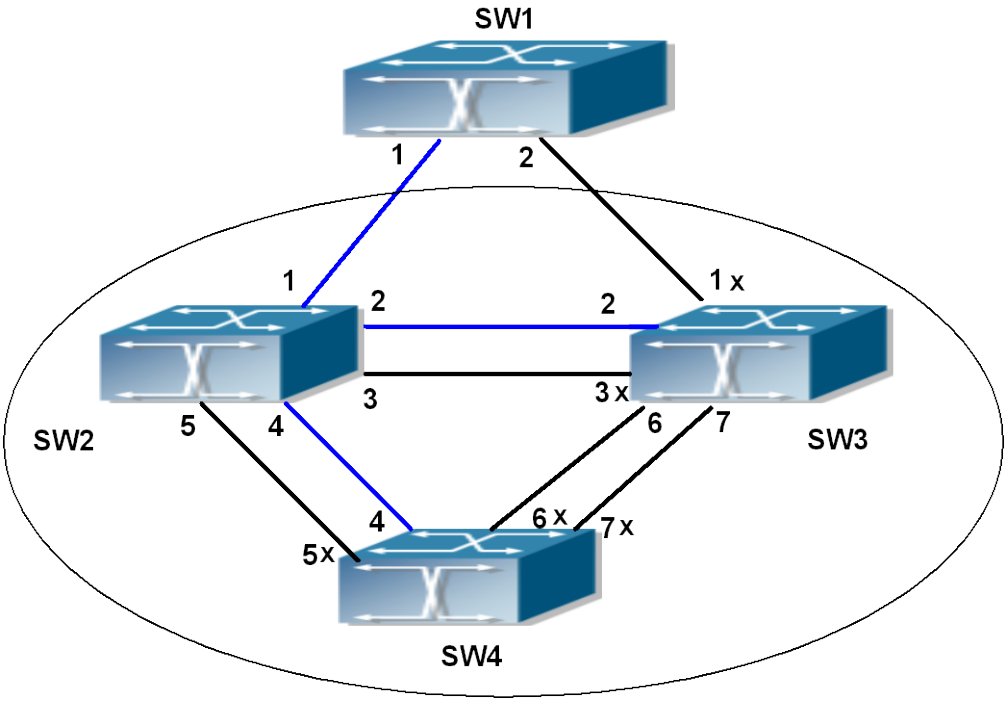


Figure 15-3 the topology of instance 0 after the change of MSTP

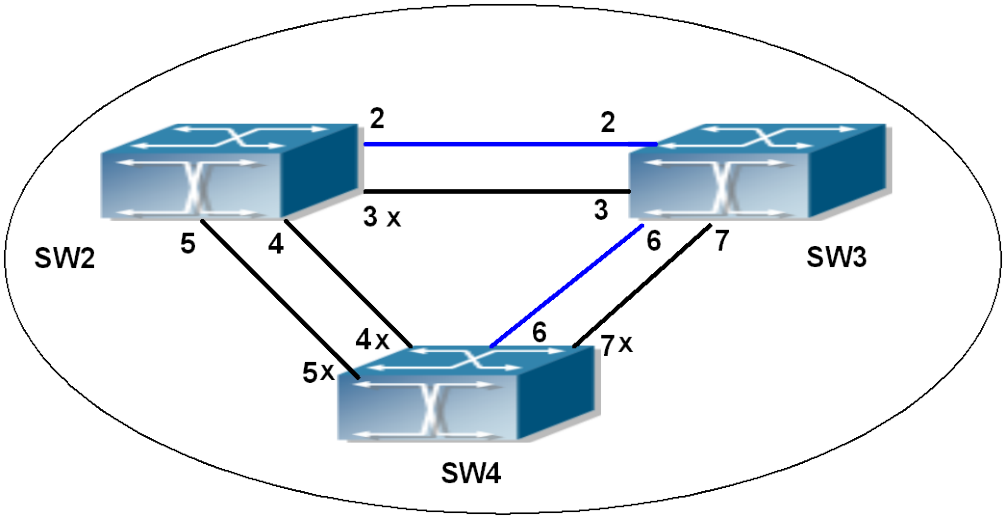


Figure 15-4 the topology of instance 3 in MSTP domain after the change of MSTP

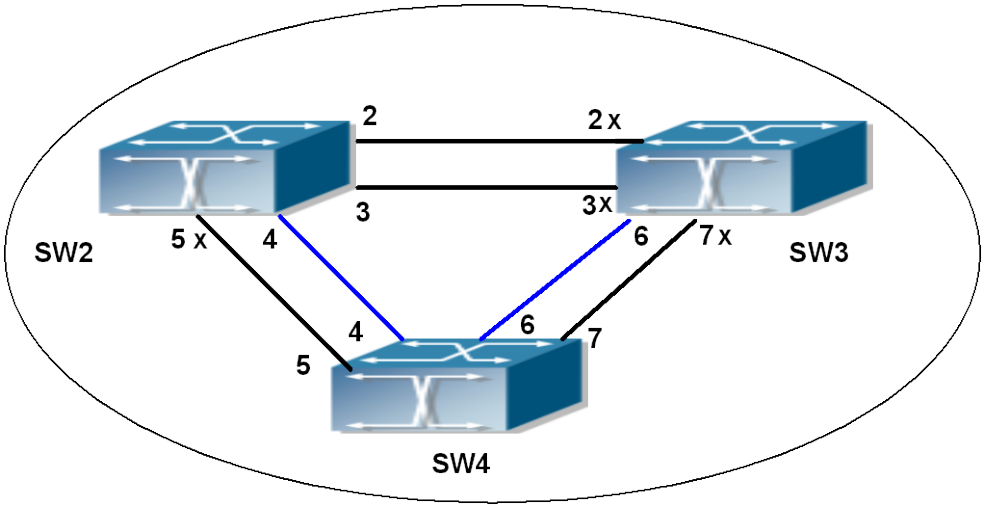


Figure 15-5 the topology of instance 4 in MSTP domain after the change of MSTP

15.4 MSTP troubleshooting help

15.4.1 monitoring and debugging commands

15.4.1.1 show spanning-tree

Command: **show spanning-tree [mst [*<instance-id>*]] [interface *<interface-list>*] [detail]**

Function: show information of MSTP protocol and instances

Parameter: ***<interface-list>*** is port list; ***<instance-id>*** is the value of instance in a range of 0-16; ***<interface-list>*** is port list; **detail** is to show spanning-tree information in detail

Command mode: authorized mode

User guide: use command to check MSTP informations of this bridge and instances, domain configuration information, interface MSTP information, etc

Example: show bridge MSTP information; showing informations are as follows

```
Switch#sh spanning-tree

                        -- MSTP Bridge Config Info --

Standard        :   IEEE 802.1s
Bridge MAC      :   00:03:0f:01:0e:30
Bridge Times :   Max Age 20, Hello Time 2, Forward Delay 15
Force Version:   3

############################## Instance 0 ##############################
Self Bridge Id     : 32768 -   00:03:0f:01:0e:30
Root Id                : 16384.00:03:0f:01:0f:52
Ext.RootPathCost : 200000
Region Root Id     : this switch
Int.RootPathCost : 0
Root Port ID       : 128.1
Current port list in Instance 0:
Ethernet1/1 Ethernet1/2 (Total 2)

 PortName         ID         ExtRPC     IntRPC   State Role       DsgBridge        DsgPort
-------------- ------- --------- --------- --- ---- ------------------ -------
 Ethernet1/1   128.001              0              0 FWD ROOT 16384.00030f010f52 128.007
 Ethernet1/2   128.002              0              0 BLK ALTR 16384.00030f010f52 128.011

############################## Instance 3 ##############################
Self Bridge Id     : 0.00:03:0f:01:0e:30
Region Root Id     : this switch
Int.RootPathCost : 0
Root Port ID       : 0
Current port list in Instance 3:
Ethernet1/1 Ethernet1/2 (Total 2)
```

```
PortName          ID       IntRPC     State Role        DsgBridge         DsgPort
--------------- ------- --------- --- ---- ------------------ -------
  Ethernet1/1    128.001              0 FWD MSTR         0.00030f010e30 128.001
  Ethernet1/2    128.002              0 BLK ALTR         0.00030f010e30 128.002

############################## Instance 4 ##############################
Self Bridge Id      : 32768.00:03:0f:01:0e:30
Region Root Id      : this switch
Int.RootPathCost : 0
Root Port ID        : 0
Current port list in Instance 4:
Ethernet1/1 Ethernet1/2 (Total 2)

PortName          ID       IntRPC     State Role        DsgBridge         DsgPort
--------------- ------- --------- --- ---- ------------------ -------
  Ethernet1/1 128.001              0 FWD MSTR 32768.00030f010e30 128.001
  Ethernet1/2 128.002              0 BLK ALTR 32768.00030f010e30 128.002
```

Showing contents	explnantion
bridge information	
Standard	STP version
Bridge MAC	MAC of this bridge
Bridge Times	configuration values of of this bridge
Force Version	version value of currently operating STP protoocl
Instance information	
Self Bridge Id	priority and MAC of the bridge corresponding to this instance
Root Id	priority and MAC of the root bridge corresponding to this instance
Ext.RootPathCost	the cost of path from bridge to network common root
Int.RootPathCost	the cost of path from bridge to this instance regional root
Root Port ID	root port of this instance in bridge
port list which MSTP protocol put into effect in this instanc e	
PortName	port name
ID	port priority and port index value
ExtRPC	the cost of path from port to network common root
IntRPC	the cost of path from port to this instance regional root
State	port state of this instance
Role	port role of this instance
DsgBridge	upstream designated bridge of this instance port
DsgPort	upstream designated port of this instance port

15.4.1.2 show mst configuration

Command: **show spanning-tree mst config**
Function: show configuration situation of effective MSTP domain parameters in authorized mode
Command mode: authorized configuration mode
User guide: in authorized mode, input this command to check currently effective MSTP domain parameters, such as MSTP domain name, revision value, VLAN-to-Insatnce mapping relations
Example: showing the circumstance of switch MSTP domain configuration
Switch#show spanning-tree mst config

Name KYLAND
Revision 0
Instance Vlans Mapped
---
00 1-29, 31-39, 41-4094
03 30
04 40

15.4.1.3 show mst-pending

Command: **show mst-pending**
Function: in MSTP domain configuration mode, show current circumstance of MSTP domain parameter configuration
Command mode: MSTP domain configuration mode
User guide: in MSTP domain configuration mode, input his command to check current MSTP domain configuration parameters, such as MSTP domain name, revision value, VLAN to Instance mapping relations
Note: before exiting from MSTP domain configuration mode, parameter configuration which this command show might be not taken effect
Example: show current parameter configuration circumstance of switch MSTP domain
Switch(Config)#spanning-tree mst configuration
Switch(Config-Mstp-Region)#show mst-pending

Name a
Revision 0
Instance Vlans Mapped
---
00 1-29, 31-39, 41-4093
03 30
04 40
05 4094

Switch(Config-Mstp-Region)#

15.4.1.4 debug spanning-tree

Command: **debug spanning-tree**
no debug spanning-tree
Function: open MSTP debugging information; no command is to close MSTP debugging information

Command mode: authorized mode

User guide: this command is the master switch of MSTP ‘s vast and complex debug functions; gradually trun on corresponding debugging switches, then open this master switch to input debug printing information.the functions of debugging switches in different levels include: checking the transmitting and receiving situation of bpdu message in MSTP protocol operation, event process, state machine, timer, etc. generally, this debugging informations are provided to technical engineers for debugging.

Example: open port 1/1 to receive debug information of BPDU message

Switch#debug spanning-tree

Switch#debug spanning-tree bpdu rx interface e1/1

15.4.2 MSTP troubleshooting help

- ☞ If user want to operate MSTP in switch, firstly turn on MSTP switch in global. Before opening global MSTP switch, it is not allowed to open port MSTP switch.
- ☞ MSTP timer parameters are related each other, so fault configuration might cause switch abnormal working. The realtions between timers are:
  2×(Bridge_Forward_Delay – 1.0 seconds) >= Bridge_Max_Age
  Bridge_Max_Age >= 2 ×(Bridge_Hello_Time + 1.0 seconds)
- ☞ When user modify MSTP parameters, all generated toplologies should be clear. Except global bridge-based parameter configuration, others are instance-based configuration, so please ensure if corresponding instances of parameters are right in configuration
- ☞ Switch port MSTP function is exclusive to port MAC binding and 802.1x functions., so if a port has configured MAC binding or 802.1x, it is unable to enable port MSTP function.

15.5 WEB management

15.5.1 Enable MSTP

Click Device Advanced Configuration→MSTP Configuration→Enable MSTP to open configuration page. User can enable or disable MSTP, set MSTP mode, MSTP port mcheck

MSTP status-enable/disable

MSTP mode-MSTP or STP

Port—layer 2 port

Click “Apply”

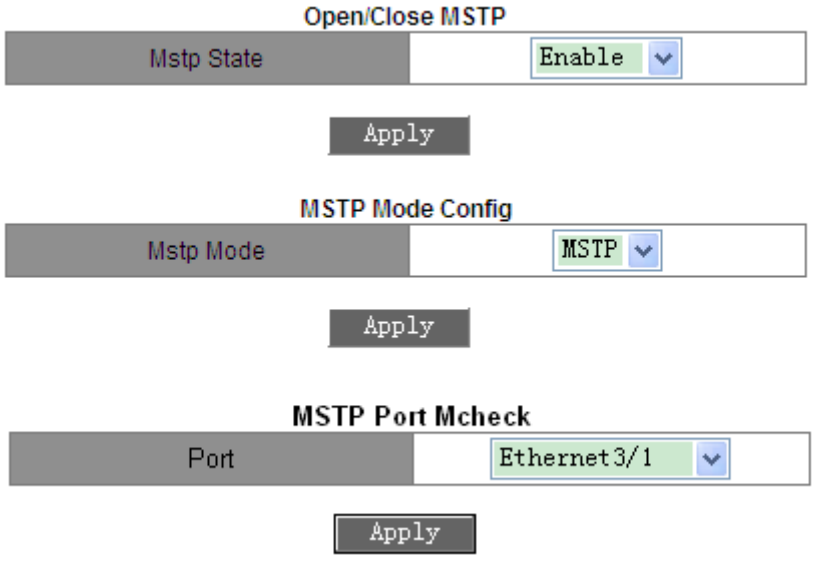


Figure 15-6 enable MSTP

15.5.2 Enable port MSTP

Click Device Advanced Configuration→MSTP Configuration→Enable port MSTP to open configuration page. User can enable or disable MSTP in a port

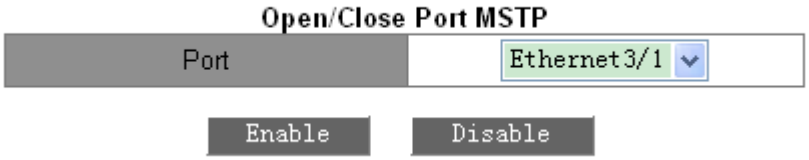


Figure 15-7 enable port MSTP

15.5.3Set MSTP Region

Click Device Advanced Configuration→MSTP Configuration→Set MSTP Region to open configuration page. User can set MSTP region name, revision level, cerate/delete instance

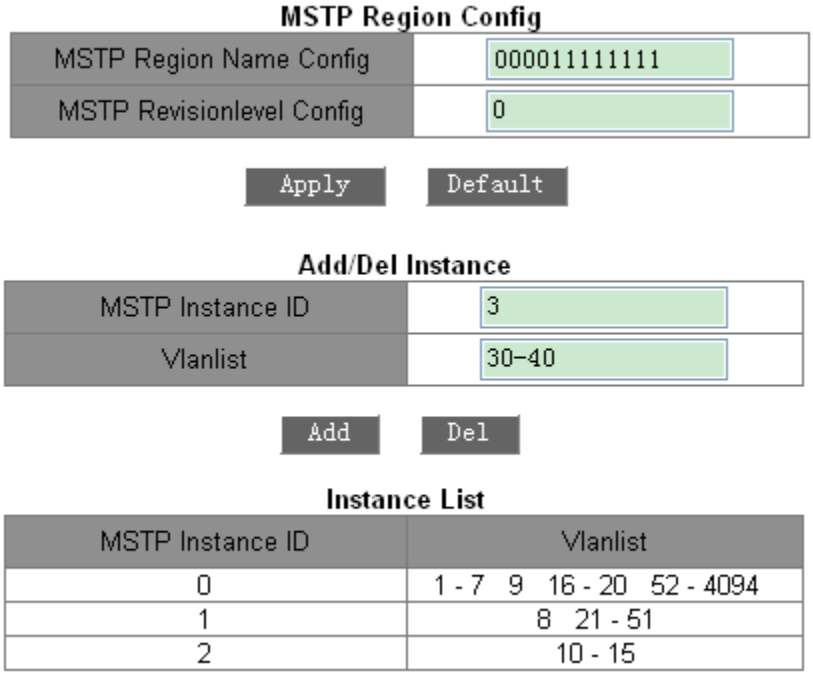


Figure 15-8 configure MSTP domain parameters

15.5.4 Set instance

Click Device Advanced Configuration→MSTP Configuration→Set instance to open configuration page. User can set MSTP priority, priority and MSTP port cost and priority

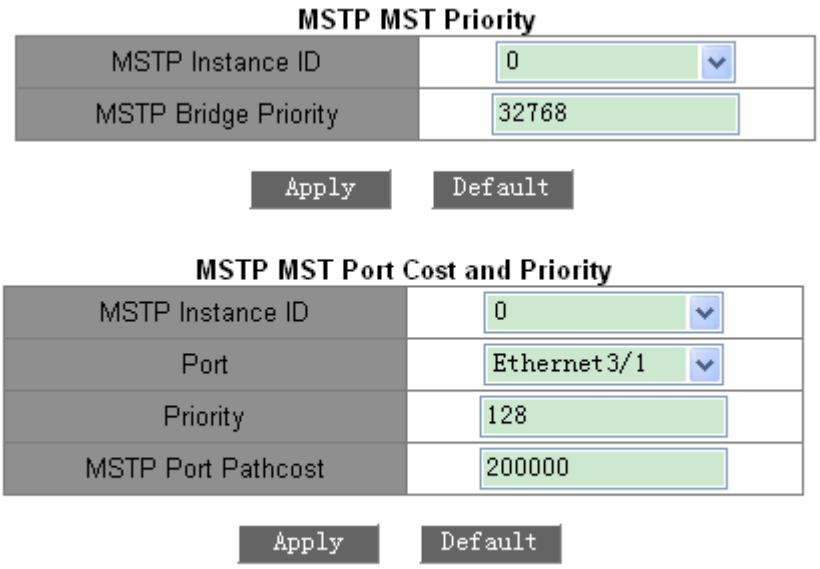


Figure 15-9 configure instance parameters

15.5.5 Set MSTP Time

Click Device Advanced Configuration→MSTP Configuration→Set MSTP Time to open configuration page. User can set forward time, Hello time, maxage time, max hop

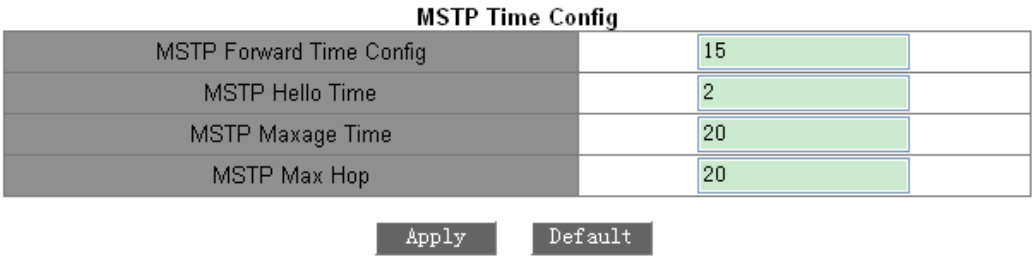


Figure 15-10 set MSTP time

15.5.6 Set MSTP Fast Transfer

Click Device Advanced Configuration→MSTP Configuration→Set MSTP Fast Transfer to open configuration page. User can set port link types, and set/cancel marginal port.

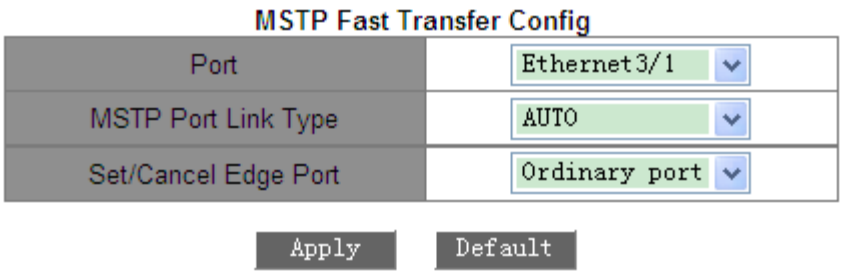


Figure 15-11 set MSTP fast transfer

15.5.7 MSTP information

Click Device Advanced Configuration→MSTP Configuration→Set MSTP Information

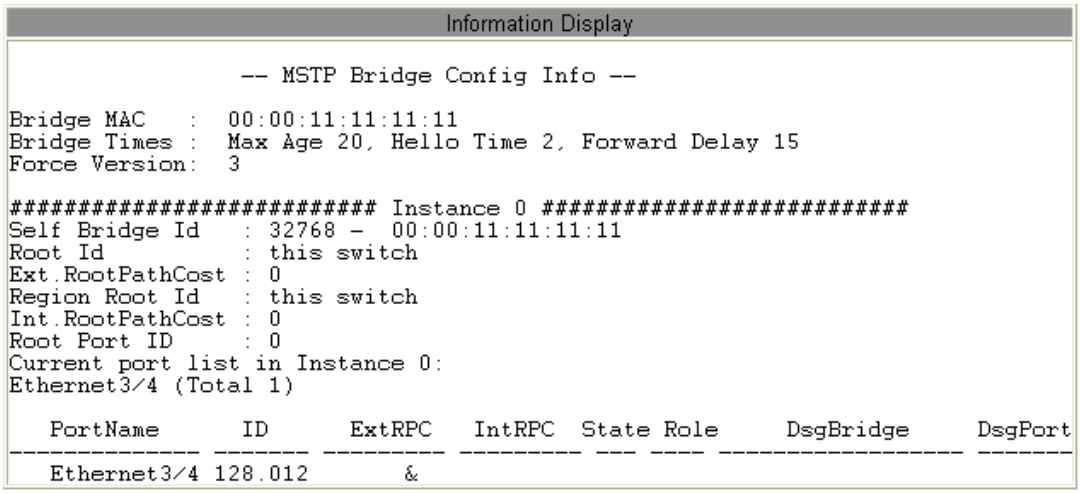


Figure 15-12 MSTP information

Chapter 16 VRRP Configuration

16.1 VRRP

16.2 VRRP configuration

16.2.1 VRRP configuration tasks

1. create VRRP instance
2. set VLAN interface of VRRP session
3. set virtual IP address of VRRP
4. enable VRRP instance

1. Create VRRP instance

Command	explanation
global configuration mode	
router vrrp <vrid> **no router vrrp <vrid>**	Create VRRP instance

2. Set VLAN interface of VRRP session

Command	explanation
VRRP instance mode	
interface vlan *<vlan-id>* **no interface**	Set VLAN interface of VRRP session

3. Set virtual IP address of VRRP

Command	explanation
VRRP instance mode	
virtual-ip *< A.B.C.D >* {master | backup} **no virtual-ip**	Set virtual IP address of VRRP

4. Enable VRRP instance

Command	explanation
VRRP instance mode	
Enable（Disable）	Enable /disable VRRP instance

16.2.2 VRRP configuration commands

16.2.2.1 Router vrrp

Command: **router vrrp <vrid>**

no router vrrp <vrid>

Function: create VRRP instance; no command is to delete designated VRRP instance

Parameter: **<vrid>** is VRRP instance number in a range of 1~255

Command mode: global configuration mode

Default: do not create VRRP instance

User guide:

Example: create VRRP instance 5 in global configuration mode

SWITCH (Config)# router vrrp 5

16.2.2.2 interface vlan

Command: **interface vlan *<vlan-id>***

no interface

Function: set VRRP session interface; no command is to delete VRRO session interface
Parameter: ***<vlan-id>*** is VLAN ID of created VLAN
Command mode: VRRP instance mode
Default: do not specify VRRP session interface
User guide:
Example: specify Vlan1 to be VRRP session interface
SWITCH (Config-Router-Vrrp)# interface vlan 1

16.2.2.3 virtual-ip

Command: **virtual-ip *< A.B.C.D >* {master | backup}**
no virtual-ip
Function: ***< A.B.C.D >*** is virtual IP address of VRRP; **Master** means this switch is set to be master routing switch; **backup** means this switch is configured to be backup routing switch
Command mode: VRRP instance mode
Default: do not specify VRRP session interface
User guide: when switch is set to be master routing switch, virtual IP address must be the IP address of VRRP session interface
Example: in VRRP instance mode, configure this switch to be backup routing IP address and virtual IP address is 192.168.0.3
SWITCH (Config-Router-Vrrp)# virtual-ip 192.168.0.3 backup

16.2.2.4 enable

Command: **enable**
Function: enable VRRP instance
Parameter: none
Command mode: VRRP instance mode
Default: disable VRRP instance
User guide: none
Example: enable VRRP instance
SWITCH (Config-Router-Vrrp)# enable

16.2.2.5 disable

Command: **disable**
Function: disable VRRP instance
Parameter: none
Command mode: VRRP instance mode
Default: disable VRRP instance
User guide: none
Example: disable VRRP instance
SWITCH (Config-Router-Vrrp)# disable

16.2.2.6 priority

Command: **priority *<pri-value>***
no priority
Function: set VRRP priority; no command is to restore default value of VRRP priority
Parameter: ***<pri-value>*** is VRRP priority in a range of 1~255
Command mode: VRRP instance mode
Default: deault value of VRRP priority is 100

User guide: none
Example: in VRRP instance mode, set VRRP priority to 200
SWITCH (Config-Router-Vrrp)# priority 200

16.2.2.7 advertisement-interval

Command: **advertisement-interval <*time_val*>**
no advertisement-interval
Function: set the interval of sending VRRP message; no command is to restore default value
Parameter: **<*time_val*>** is the interval of sending VRRP message with the unit of second and in a range of 1~10s
Command mode: VRRP instance mode
Default: default interval of sending VRRP message is 1s
User guide: none
Example: in VRRP instance mode, set the interval of sending VRRP message to 3s
SWITCH (Config-Router-Vrrp)# advertisement-interval 3

16.2.2.8 preempt-mode

Command: preempt-mode **{true| false}**
Function: set preempt-mode of VRRP priority
Parameter: **true** is to open VRRP priority preempting mode; **false** is to close VRRP priority preempting mode
Command mode: VRRP instance mode
Default: open VRRP priority preempting mode
User guide: none
Example: close VRRP priority preempting mode
SWITCH (Config-Router-Vrrp)# preempt-mode false

16.2.2.9 circuit-failover

Command: **circuit-failover vlan <*vlan-id*> <*pri_value*>**
no circuit-failover
Function: enable degradation function of VRRP designated interface failures
Parameter: <vlan-id> is VLAN ID of created VLAN, VRRP failure checking interface; <pri_value> is the priority of degradation in a range of 1~253 when VRRP checking interface failures
Command mode: VRRP instance mode
Default: when VRRP designated interface fails, degrade VRRP priority to 10
SWITCH (Config-Router-Vrrp)# circuit-failover vlan 100 10

16.2.2.10 ip vrrp authentication mode text

Command: **ip vrrp authentication mode text**
no ip vrrp authentication mode
Function: enable VRRP text authentication function; no command isto disable VRRP text authentication function
Parameter: none
Command mode: interface configuration mode
Default: disable VRRP text authentication function
User guide: none
Example: enable VRRP text authentication function
SWITCH (Config-If-Vlan1) # ip vrrp authentication mode text

16.2.2.11 ip vrrp authentication string

Command: **ip vrrp authentication string *<key-str>***

no ip vrrp authentication string

Function: set VRRO text authentication string; no command is to clear VRRP text authentication string

Parameter: ***<key-str>*** is text authentication string; the text length is in a range of 1~8

Command mode: interface configuration mode

Default: there is not VRRP text authentication string

User guide: VRRP text authentication string will take effect onluy after VRRP text authentication function is enabled.

Example: set VRRP text authentication string to kyland

SWITCH (Config-If-Vlan1)# ip vrrp authentication string kyland

16.3 VRRP example

VRRP typical example is as follows:

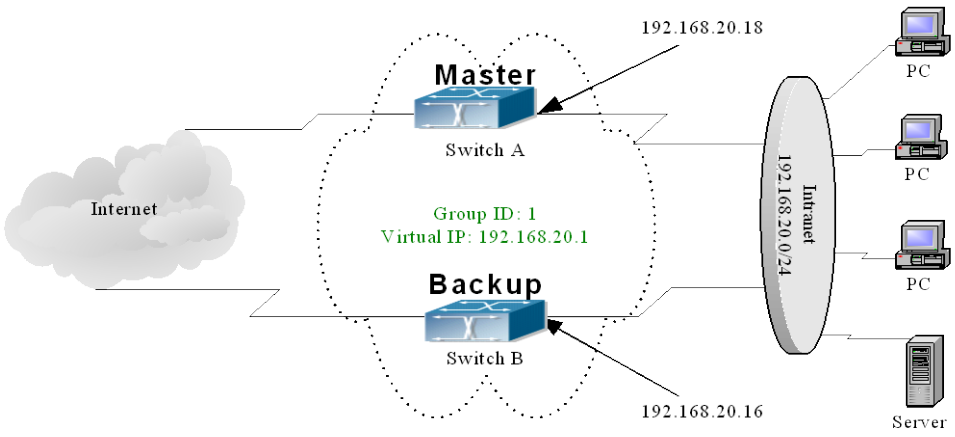


Figure 16-1 network connection

Switch A configuration:

(1) configure IP address of VLAN1 interface

Switch A (Config)#interface vlan 1

Switch A (Config-If-Vlan1)# ip address 192.168.20.18 255.255.255.0

(2) configure VRRP instance 1 and priority is 200

Switch A (Config)#router vrrp 1

Switch A (Config-Router-Vrrp)#interface vlan 1

Switch A (Config-Router-Vrrp)#virtual-ip 192.168.20.1 backup

Switch A (Config-Router-Vrrp)#priority 200

Switch A (Config-Router-Vrrp)#enable

(3) VRRP instance information of Switch A

Switch A#show vrrp

VrId <1>

State is Master

Virtual IP is 192.168.20.1 (Not IP owner)

Interface is Vlan1

Priority is 200
Advertisement interval is 1 sec
Preempt mode is TRUE

Switch B configuration:
(1) configure Ip address of VLAN1 interface
Switch B (Config)#interface vlan 1
Switch B (Config-If-Vlan1)# ip address 192.168.20.16 255.255.255.0
(2) configure VRRP instance 1 and priority is 50
Switch B (Config)#router vrrp 1
Switch B (Config-Router-Vrrp)#interface vlan 1
Switch B (Config-Router-Vrrp)#virtual-ip 192.168.20.1 backup
Switch B (Config-Router-Vrrp)#priority 50
Switch B (Config-Router-Vrrp)#enable
(3) VRRP instance information of Switch B
Switch B #show vrrp
VrId <1>
State is backup
Virtual IP is 192.168.20.1 (Not IP owner)
Interface is Vlan1
Priority is 50
Advertisement interval is 1 sec
Preempt mode is TRUE

PC and Server configuration:
Configure the gateway of each PC and Server in configuration network to be 192.168.20.1.

16.4 VRRP troubleshooting help

16.4.1 monitoring and debugging commands

16.4.1.1 show vrrp

Command: **show vrrp** [**vrid]**
Function: show related information of VRRP instance
Parameter: [**vrid]** is VRRP instance number in a range of 1~255
Command mode: authorized mode
Default:
User guide: show configuration information of VRRP instance and protocol operation state
Example:
SWITCH# show vrrp 1
VrId <1>
State is Master
Virtual IP is 192.168.2.3 (Not IP owner)
Interface is Vlan1
Priority is 100
Advertisement interval is 1 sec
Preempt mode is TRUE

Showing contents	explanation
VrId	VRRP instance number
State	VRRP protocol operation state
Virtual IP	virtual IP of VRRP instance
Interface	session interface of VRRP instance
Priority	priority of VRRP instance
Advertisement interval	sending message interval of VRRP instance
Preempt mode	priority preempting mode of VRRP instance

16.4.1.2 debug vrrp

Command: **debug vrrp [all] [event] [packet [recv | send]]**

no debug vrrp [all] [event] [packet [recv | send]]

Function: open VRRP debugging information; no command is to close VRRP debugging information

Parameter: [all]: turn on all VRRP protocol degugging switches

[event]: turn on debugging switch of VRRP protocol event processing

[packet]: turn on debugging switch of VRRP protocol receiving and transmitting packets

[recv]: turn on debugging switch of VRRP receiving packets

[send]: turn on debugging switch of VRRP transmitting packets

Command mode: authorized mode

User guide: generally, these debugging informations are provided to technical engineers, user need not care about them.

Example: enable all VRRP protocol debugging switches

Switch#debug vrrp all

16.4.2 VRRP troubleshooting help

(1) virtual IP address of VRRP and session interface IP address should be in a same segment

(2) when VRRP instance is set to be master routing switch, virtual IP address should be session interface IP address, otherwise configuration is invalid. After master routing switch configuration, this instance priority will be fixed to 255, which is not allowed to be changed

16.5 WEB Management

16.5.1 create/delete VRRP instance

Click Device Advanced Configuration→VRRP Configuration→Set/Del VRRP to open configuration page. User can add or delete VRRP instance

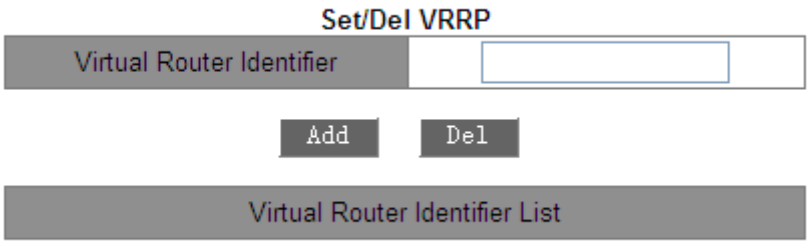


Figure 16-2 create/delete VRRP instance

16.5.2 VRRP Initialization

Click Device Advanced Configuration→VRRP Configuration→VRRP initialization to open configuration page. User can set virtual IP, host type (backup/master), L3 interface for VRRP,

enable/disable VRRP

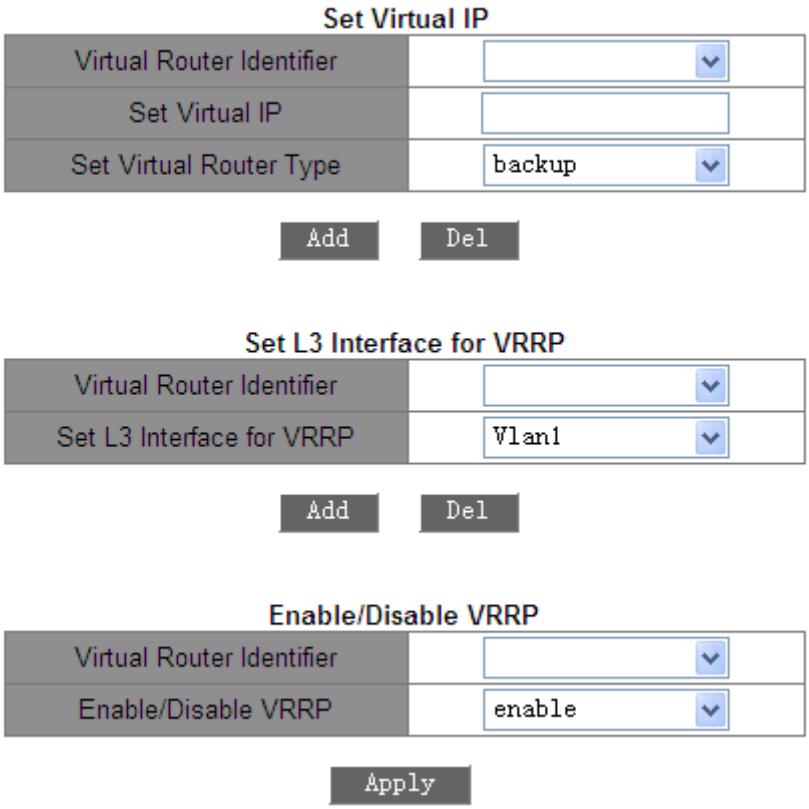


Figure 16-3 VRRP initialization configuration

16.5.3 Set Preempt Mode

Click Device Advanced Configuration→VRRP Configuration→Set Preempt Mode to open configuration page. User can set router priority, preempt mode (true/false)

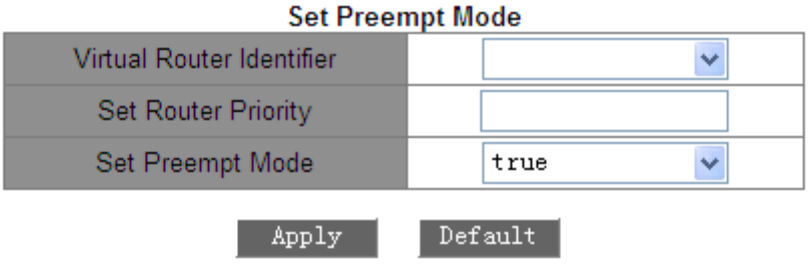


Figure 16-4 setting session priority mode

16.5.4 Set advertisement interval and Circuit Failover

Click Device Advanced Configuration→VRRP Configuration→Set Advertisement Interval and Circuit Failover to open configuration page. User can set advertisement interval, and the priority of loop tast

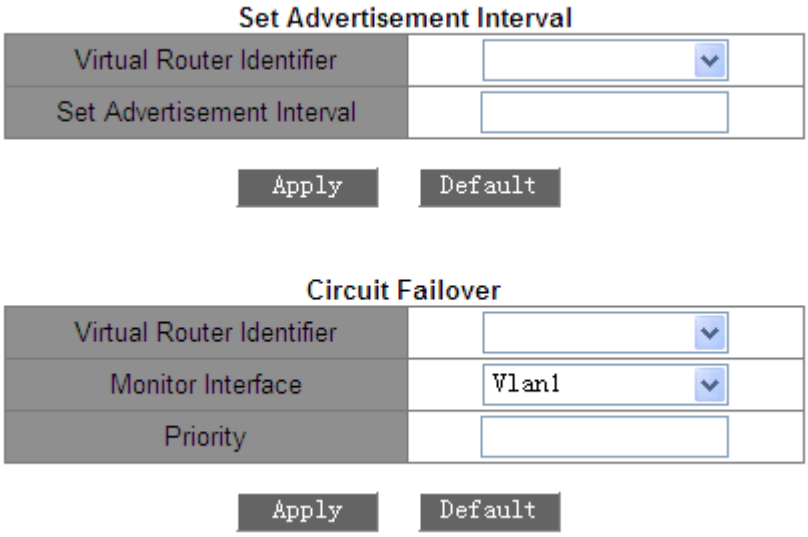


Figure 16-5 configure advertisement interval and circuit failover

16.5.5 VRRP Authentication

Click Device Advanced Configuration→VRRP Configuration→VRRP Authentication to open configuration page. User can set authentication mode and authentication string.

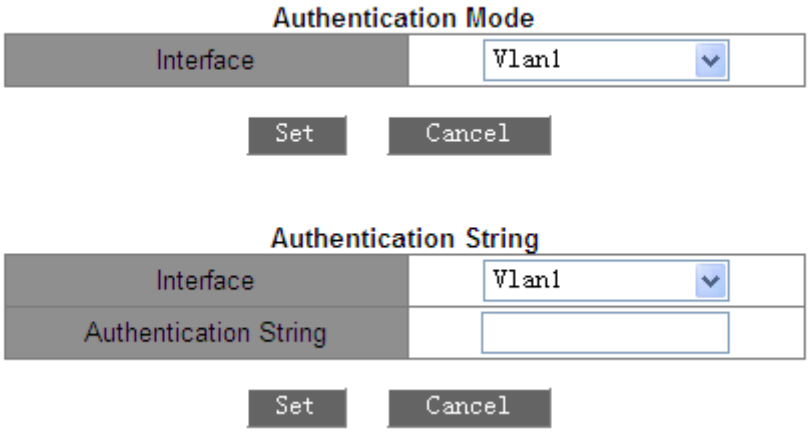


Figure 16-6 VRRP authentication parameters

16.5.6 VRRP Information

Click Device Advanced Configuration→VRRP Configuration→VRRP Information

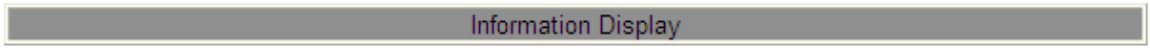


Figure 16-7 VRRP main information

Chapter 17 Configure DT-Ring Protocols

17.1 DT-Ring protocols introduction

Industrial Ethernet switches are widely used in the fileds of power distribution, digital substation, wind power plant, transportation, highspeed railway, industrial control, etc.

Industrial environments has hight requirements on stable and realiable communication, fast fault recovery, etc. STP/RSTP/MSTP protocols can not perfectly meet the requirements. DT-Ring protocols are developed by KYLAND, which are designed for industrial data communication, including DT-Ring, DT-Ring+ and DT-VLAN.

17.2 DT-Ring introduction

DT-Ring is develop and owned by Kyland proprietarily. This protocol test the state of ring port and pass few protocol messages to decide the state of port on ring and ensure the redundant ring network work properly, to make the redundant Ethernet fast and stable, and finally to meet the needs of industrial communication. In the below topology, one switch is set as master and other three switches are slaves

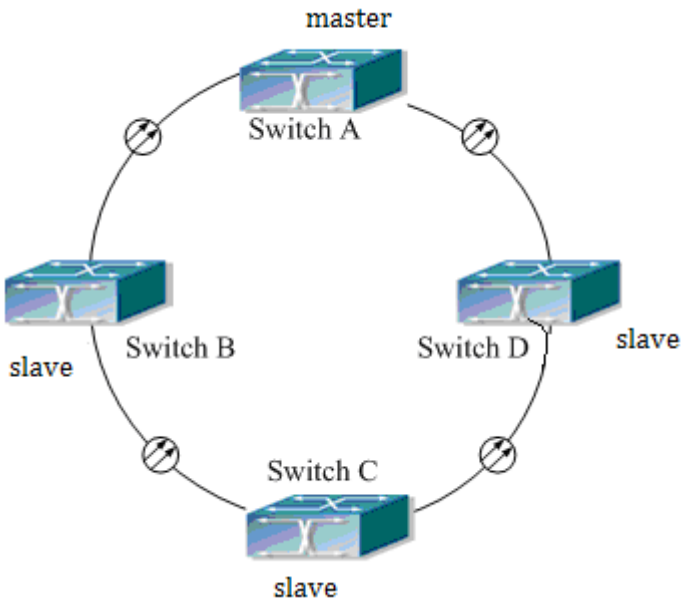


Figure 17-1 DT-Ring Network Mode

Configuration Instruction:

- On the same switch, it is able to configure several domains to set the tangency ring network mode
- In the same ring, switches needs to configure same domain ID. For the convenience of maintaining, set the same name of domain.
- In one ring, only one master, others are all slaves

17.3 Configure DT-Ring

17.3.1 DT-Ring configuration tasks

1. create/delete DT-Ring domain
2. add/delete ring port
3. enable/disable DT-Ring domain protocol
4. show DT-Ring domain state

1. Create/delete DT-Ring domain

Command	explanation
global configuration mode	
dt-ring new <1-31> domain <1-32> master/slave	configure DT-Ring, firstly create DT-Ring domain
dt-ring del domain <1-32>	delete DT-Ring domain

2. Add/delete ring port

Command	explanation
Global configuration mode	
ringport add <interface-id>	add ring port
ringport delete <interface-id>	delete ring port

3. Enable/disable DT-Ring domain protocols

Command	explanation
global configuration mode	
protocol enable	enable DT-Ring domain protocol
protocol disable	disable DT-Ring domain protocol

4. Show DT-Ring domain state

Command	explanation
Privilege user configuration mode	
show dt-ring <1-32>	show DT-Ring state, including basic configuration information, and protocol state information

17.3.2 DT-Ring Configuration Commands

17.3.2.1 create/delete dt-ring domain

Command: **dt-ring new <1-31> domain <1-32> master/slave**

dt-ring del domain <1-32>

Function: create/delete DT-Ring domain

Parameter: ***<1-31>*** is domain name; ***<1-32>*** is domain ID; master, configure this DT-Ring domain to master station; slave, configure this domain to salve station.

Command mode: global configuration mode

User guide: before DT-Ring configuration, firstly create DT-Ring domain

Example: configure a DT-Ring with domain name 2 and domain ID 2, and set it to be master station

Switch (Config)# dt-ring new 2 domain 2 master

17.3.2.2 add/delete ring port

Command: **SWITCH(config)#dt-ring <1-32>**

SWITCH(config-dt-ring-1)#ringport add <interface-id>

SWITCH(config-dt-ring-1)#ringport delete <interface-id>

Function: create/delete ring port

Parameter: ***<1-32>*** is domain ID; <***interface-id***> is switch port ID

Command mode: global configuration mode

Default: in DT-Ring, we need to configure ring ports according to actual requirements to form redundant ring network.

Attention: add ring port to dt-ring 2, port ID is 1/1, 1/2

Example: add ring port to dt-ring 2, port ID is 1/1, 1/2
Switch (Config)# dt-ring 2
Switch(config-dt-ring-2)#ringport add ethernet 1/1-2

17.3.2.3 enable/disable DT-Ring domain protocol

Command: **SWITCH(config)#dt-ring <1-32>**
SWITCH(config-dt-ring-1)#protocol enable
SWITCH(config-dt-ring-1)#protocol disable
Function: enable/disable DT-Ring domain protocol
Parameter: ***<1-32>*** is domain ID
Command mode: global configuration mode
Default: there is not this configuration
User guide: in order to take DT-ring effct, enable DT-Ring domain
Example: enable dt-ring 2
Switch (Config)# dt-ring 2
Switch (config-dt-ring-2)#protocol enable

17.3.2.4 show DT-Ring domain state

Command: **SWITCH#show dt-ring <1-32>**
Function: show DT-Ring domain state
Parameter: ***<1-32>*** is domain ID
Command mode: privilege user configuration mode
Default: there is not this configuration
User guide: show DT-Ring state, including basic configuration information and protocol state information
Example: show the state of dt-ring2 domain
Switch #show dt-ring 2

17.4 DT-Ring+ introduction

DT-Ring+ is also developed by Kyland. It is to achieve a backup in two rings. According to the backup device ID to decide the state of port and ring and ensure the redundant ring network work properly, to make the redundant Ethernet fast and stable, and finally to meet the needs of industrial communication. Its network topology is as follows:

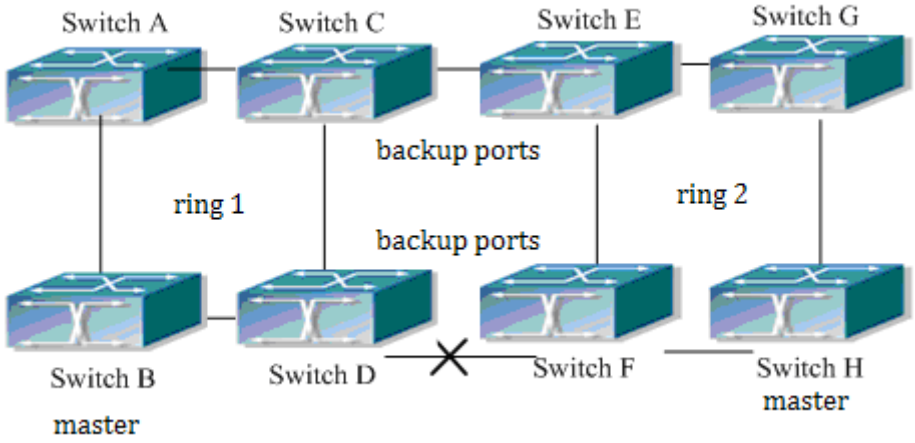


Figure 17-2 DT-Ring+

Configuration instructions:

- One switch only supports one backup port,
- In a same ring, the max number of backup ports is 2
- In a same ring, master can configure backup port

17.5 DT-Ring+ configuration

17.5.1 DT-Ring configuration tasks

1. create/delete DT-Ring+
2. add/delete backup ports
3. show DT-Ring+ state

1. Create/delete DT-Ring+

Command	explanation
global configuration mode	
dtring+ enable	Create DT-Ring+
dtring+ disable	Delete DT-Ring+

2. Add/delete backup ports

command	explanation
Global configuration mode	
backport add <interface-id>	delete backup port
backport delete <interface-id>	add backup port

3. Show DT-Ring+ state

Command	explanation
privilege user configuration mode	
show dt <1-32>	show DT-Ring+ state, mainly presenting the information of backup port

17.5.2 DT-Ring configuration commands

17.5.2.1 create/delete DT-Ring+

Command: **SWITCH(config)#dt <1-32>**

SWITCH(config-dt-ring-1)#dtring+ enable

SWITCH(config-dt-ring-1)#dtring+ disable

Function: create/delete Dt-Ring+

Parameter: ***<1-32>*** is domain ID

Command mode: global configuration mode

Default: there is not this configuration

User guide: before configuring DT-Ring+, we need to create DT-Ring domain

Example: configure dt-ring 2, enable DT-Ring+

Switch (Config)#dt 2

Switch (config-dt-ring-2)#dtring+ enable

17.5.2.2 add/delete backup port

Command: **SWITCH(config)#dt <1-32>**

SWITCH(config-dt-ring-1)#backport add <interface-id>

SWITCH(config-dt-ring-1)#backport delete <interface-id>

Function: add/delete backup port

Parameter: ***<1-32>*** is domain ID, <***interface-id***> is port ID

Command mode: global configuration mode

Default: there is not this configuration

User guide: in DT-Ring, we need to configure backup port according to actuial requirements to form backup between redundant ring network

Example; add backup port to dt-ring 2 and port ID is 1/3

Switch (Config)#dt 2

Switch (config-dt-ring-2)#backport add ethernet 1/3

17.5.2.3 show DT-Ring+ state

Command: **SWITCH#show dt <1-32>**

Parameter: ***<1-32>*** is domain ID

Default: there is not this configuration

User guide: show DT-Ring+ state, mainly presenting backup port information

Example: show dt-ring+ 2 state

Switch #show dt 2

17.6 DT-VLAN protocol introduction

DT-VLAN is a estension of DT-Ring; DT-Ring is port-based redundant ring protection, setting a redundant link in a redundant ring. DT-VLAN is link redundant protection in different VLANs. In a redundant ring physical link, we can configure multiple redundant rings according to VLANs to respectively control VLAN forwarding state in ring port.

The typical network topology of DT-VLAN is as following figure; configure SWITCHA (link AD-1) ←→SWITCH D←→SWITCH B←→SWITCH A(link AB-1), which is to form a redundant ring, SWICH A (Link AD-2)←→SWITCH D←→SWITCH B←→SWITCH A(Link AB-2), which is another redundant ring. Two rings are in different VLANs.

Configuration instructions:

- In a switch, it can configure multiple domains, meeting tangent ring network requirements
- In a same ring, switches need to configure same domain ID for easy maintenance. Same domain need is also recommended
- In a ring, there is only one master, others are salves
- A VLAN belongs to a DT-Ring domain
- If a switch configure DT-VLAN, port-base DT-Ring is not supported

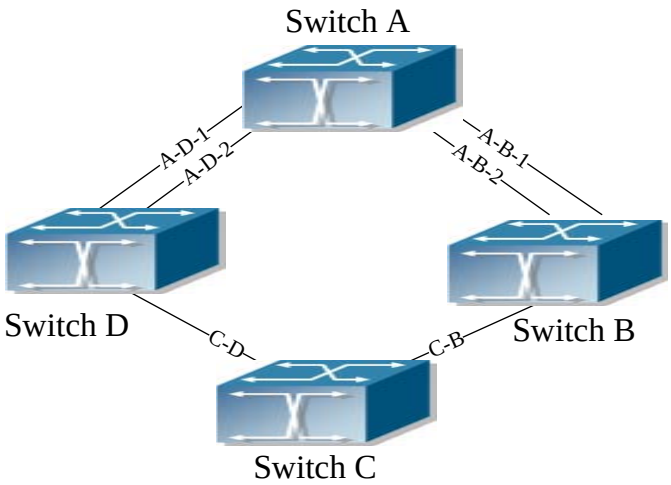


Figure 17-3: DT-VLAN typical topology

17.7 DT-VLAN Configuration

17.7.1 DT-VLAN configuration tasks

1. change DT-Ring mode
2. create/delete DT-Ring domain
3. add/delete VLAN
4. add/delete VLAN
5. enable/disable DT-Ring domain protocol
6. show DT-Ring domain state

1. Change DT-Ring domain mode

Command	Explanation
global configuration mode	
dt-ring mode vlan-based	set redundant ring mode to VLAN mode
dt-ring mode port-based	set redundant ring mode to port mode

2. Create/delete DT-Ring domain

Command	explanation
global configuration mode	
dt-ring new <1-31> domain <1-32> master/slave	create DT-Ring domain first brfore configuring DT-Ring
dt-ring del domain <1-32>	delete DT-Ring domain

3. Add/delete ring port

Command	explanation
global configuration mode	
ringport add <interface-id>	add ring port
ringport delete <interface-id>	delete ring port

4. Add/delete VLAN

Command	explanation
global configuration mode	
vlan add <1-4093>	add VLAN
vlan delete <1-4093>	delete VLAN

5. Enable/disable DT-Ring domain protocol

Command	explanation
global configuration mode	
protocol enable	enable DT-ring domain protocol
protocol disable	disable DT-Ring domain protocol

6. Show DT-Ring domain state

command	explanation
privilege user configuration mode	
show dt-ring <1-32>	show DT-Ring state, including basic configuration mode and protocol state

17.7.2 DT-VLAN configuration commands

17.7.2.1 change DT-Ring mode

Command: **dt-ring mode vlan-based**

dt-ring mode port-based

Function: set redundant ring mode to VLAN-based mode or port-based mode

Parameter: vlan-based means VLAN-based mode; port-based means port-based mode
Command mode: global configuration mode
Default: there is not this configuration
User guide: before creating VLAN-based ring, set redundant ring mode to VLAN-based mode; RSTP and DT-Ring both are port-based mode, so if enable redundant ring with VLAN-based mode, RSTP and DT-Ring can't be configured
Example: set redundant ring mode to VLAN-based mode and port-based mode
Switch (Config)# dt-ring mode vlan-based
Switch (Config)# dt-ring mode port-based

17.7.2.2 add/delete VLAN

Command: **SWITCH(config)# dt-ring <1-32>**
SWITCH(config-dt-ring-1)#vlan add <1-4093>
SWITCH(config-dt-ring-1)#vlan delete <1-4093>
Function: add/delete VLAN
Parameter: <1-32> is domain ID, <1-4093> is VLAN ID
Command mode: global configuration mode
Default:
User guide: configure the efficient VLAN in DT-Ring ; a VLAN can only be added into a DT-Ring.
Example: add VLAN3 into dt-ring 2
Switch (Config)# dt-ring 2
Switch (config-dt-ring-2)#vlan add 3

17.8 WEB Management

17.8.1 DT-Ring Mode

Click Device Advanced Configuration→DT-Ring Configuration→DT-Ring Mode to open configuration page. User can set DT-Ring redundancy mode, including port-based mode and VLAN-based mode.

Figure 17-4 set DT-Ring mode

17.8.2 DT-Ring configuration

Select, DT-ring list, click Add to enter DT-Ring configuration page
Domain ID-- <1-32>
Domain name-- <1-31>
Station type—master/slave
Ring port 1 and ring port 2 in DT-Ring
DT-Ring+ function—enable/disable
DT-Ring + backup port
Click "Apply" to take configuration effect

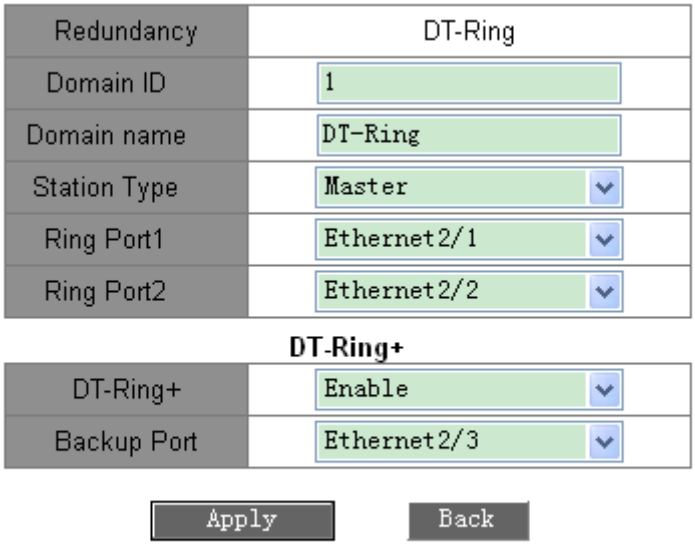


Figure 17-5 DT-Ring configuration

17.8.3 View and modify DT-Ring configuration

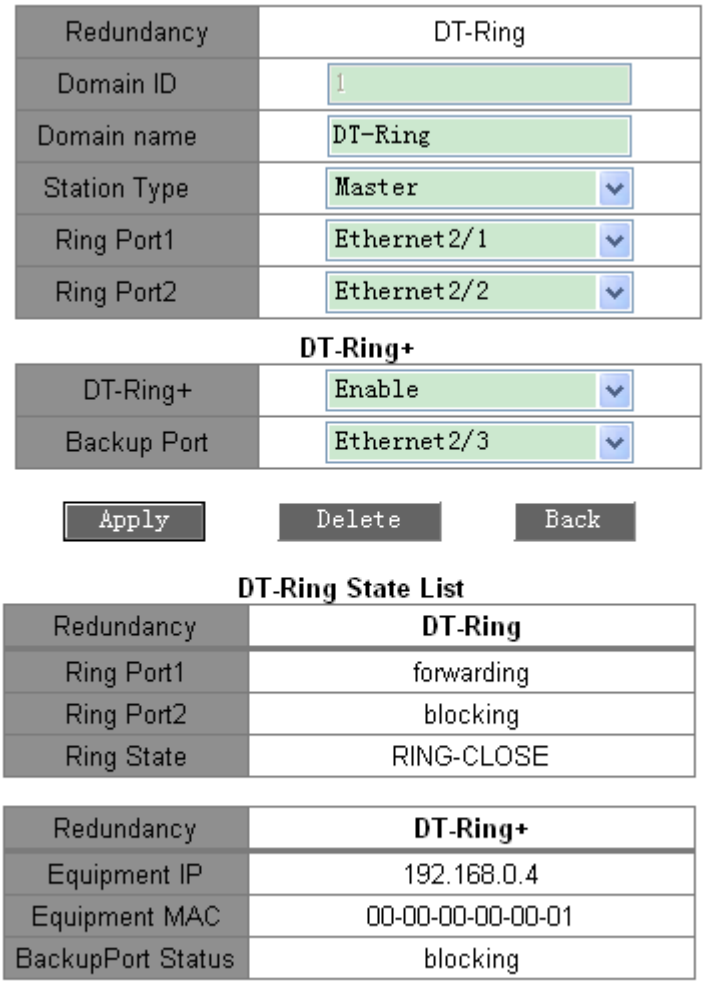


Figure 17-6 View and modify DT-Ring configuration

Appendix A: port information list

SICOM6496/SICOM6424SM	port	remarks
100M module 1	ethernet 1/1-8	
100M module 2	ethernet 2/1-8	
100M module 3	ethernet 3/1-8	
Gigabit module 4	ethernet 4/1-4	
SICOM6496	port	
Gigabit module 1	ethernet 1/1-24	
Gigabit module 2	ethernet 2/1-24	